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ABSTRACT

This document, which is intended for use by community and junior colleges throughout Mississippi, contains curriculum frameworks for the following eight programs in the electricity/electronics/related engineering technology cluster: automated manufacturing technology; communications electronics repair technology; computer servicing technology; electrical technology; electronics technology; instrumentation technology; robotics technology; and telecommunications technology. Presented in the introductory section are a program description and suggested course sequence for each program. Section I lists baseline competencies for the electrical programs and the electronics programs. Section II consists of course outlines for each course in the following six sequences: automated manufacturing technology; communications electronics repair technology; computer servicing technology; electrical technology; telecommunications technology; and related vocational/technical courses. Each course outline contains some/all of the following: course name and abbreviation; course classification; course description; prerequisites; and competencies and suggested objectives. Recommended tools and equipment are listed in section III. Appended are lists of related academic topics and workplace skills for the 21st century and student competency profiles for both courses. (MN)

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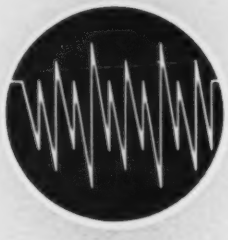
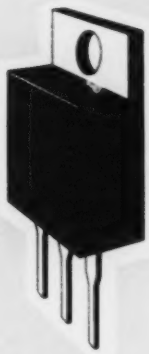
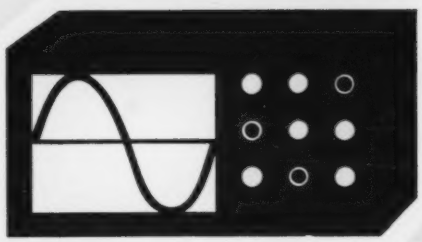
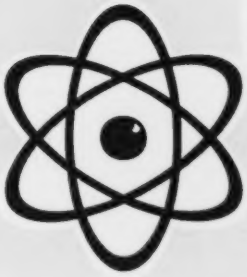
Mississippi Curriculum Framework for

Electricity/Electronics/ Related Engineering Technology Cluster









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CE 072 195

Postsecondary Vocational and Technical Education 1995

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CURRICULUM FRAMEWORK

FOR

POSTSECONDARY ELECTRICITY/ELECTRONICS/RELATED ENGINEERING PROGRAMS

AUTOMATED MANUFACTURING TECHNOLOGY (MFT)
(CIP: 15.0603 - Industrial/Manufacturing Tech)

COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY (CET)
(CIP: 47.0103 - Communications Systems Installer)

COMPUTER SERVICING TECHNOLOGY (CST)
(CIP: 15.0402 - Computer Main. Tech.)

ELECTRICAL TECHNOLOGY (ELT)
(CIP: 46.0302 - Electrician)

ELECTRONICS TECHNOLOGY (EET)
(CIP: 15.0303 - Electrical, Electronic & Comm. Tech)
(CIP: 15.0403 - Electromechanical Tech.)

INSTRUMENTATION TECHNOLOGY (INT)
(CIP: 15.0404 - Instrumentation Tech.)

ROBOTICS TECHNOLOGY (ROT)
(CIP: 15.0405 - Robotics)

TELECOMMUNICATIONS TECHNOLOGY (TCT)
(CIP: 10.0190 - Telecommunications)

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1995

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FOREWORD

In order to survive in today's global economy, businesses and industries have had to adopt new practices and procedures. Total quality management, statistical process control, participatory management, and other concepts of high performance work organizations are practices by which successful companies survive. Employers now expect their employees to be able to read, write, and communicate effectively; solve problems and make decisions; and interact with the technologies that are prevalent in today's workplace. Vocational-technical education programs must also adopt these practices in order to provide graduates who can enter and advance in the changing work world.

The curriculum framework in this document reflect these changes in the workplace and a number of other factors that impact on local vocational-technical programs. Federal and state legislation calls for articulation between high school and community college programs, integration of academic and vocational skills, and the development of sequential courses of study that provide students with the optimum educational path for achieving successful employment. National skills standards, developed by industry groups and sponsored by the U. S. Departments of Education and Labor, provide vocational educators with the expectations of employers across the United States. All of these factors are reflected in the framework found in this document.

Each postsecondary program of instruction consists of a program description and a suggested sequence of courses which focus on the development of occupational competencies. Each vocational-technical course in this sequence has been written using a common format which includes the following components:

- Course Name - A common name that will be used by all community/junior colleges in reporting students.
- Course Abbreviation - A common abbreviation that will be used by all community/junior colleges in reporting students.
- Classification - Courses may be classified as:
  - Vocational-technical core - A required vocational-technical course for all students.
  - Vocational-technical elective - An elective vocational-technical course.
  - Related academic course - An academic course which provides academic skills and knowledge directly related to the program area.
  - Academic core - An academic course which is required as part of the requirements for an Associate degree.
- Description - A short narrative which includes the major purpose(s) of the course and the recommended number of hours of lecture and laboratory activities to be conducted each week during a regular semester.

- Prerequisites - A listing of any prerequisite courses that must be taken prior to or on enrollment in the course.
- Competencies and Suggested Objectives - A listing of the competencies (major concepts and performances) and of the suggested student objectives that will enable students to demonstrate mastery of these competencies.

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75 percent of the time allocated to each course. For example, in a four semester hour course consisting of 30 hours lecture and 120 hours of laboratory activities, approximately 22 hours of lecture and 90 hours of lab should be taken by the competencies and suggested objectives identified in the course framework. The remaining 25 percent of each course should be developed at the local district level and may reflect:
  - Additional competencies and objectives within the course related to topics not found in the State framework, including activities related to specific needs of industries in the community college district.
  - Activities which develop a higher level of mastery on the existing competencies and suggested objectives.
  - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed/revised.
  - Activities which implement components of the Mississippi Tech Prep initiative, including integration of academic and vocational-technical skills and coursework, school-to-work transition activities, and articulation of secondary and postsecondary vocational-technical programs.
  - Individualized learning activities, including worksite learning activities, to better prepare individuals in the courses for their chosen occupational area.

- Sequencing of the course within a program is left to the discretion of the local district. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors.

- Programs that offer an Associate of Applied Science degree must include a minimum 15 semester credit hour academic core. Specific courses to be taken within this core are to be determined by the local district. Minimum academic core courses are as follows:

- 3 semester credit hours Math/Science Elective
- 3 semester credit hours Written Communications Elective
- 3 semester credit hours Oral Communications Elective
- 3 semester credit hours Humanities/Fine Arts Elective
- 3 semester credit hours Social/Behavioral Science Elective

It is recommended that courses in the academic core be spaced out over the entire length of the program, so that students complete some academic and vocational-technical courses each semester. Each community/junior college has the discretion to select the actual courses that are required to meet this academic core requirement.

- In instances where secondary programs are directly related to community and junior college programs, competencies and suggested objectives from the high school programs are listed as Baseline Competencies. These competencies and objectives reflect skills and knowledge that are directly related to the community and junior college vocational-technical program. In adopting the curriculum framework, each community and junior college is asked to give assurances that:
  - students who can demonstrate mastery of the Baseline Competencies do not receive duplicate instruction, and
  - students who cannot demonstrate mastery of this content will be given the opportunity to do so.

- The roles of the Baseline Competencies are to:
  - Assist community/junior college personnel in developing articulation agreements with high schools, and
  - Ensure that all community and junior college courses provide a higher level of instruction than their secondary counterparts

- The Baseline Competencies may be taught as special "Introduction" courses for 3-6 semester hours of institutional credit which will not count toward Associate degree requirements. Community and junior colleges may choose to integrate the Baseline Competencies into ongoing courses in lieu of offering the "Introduction" courses or may offer the competencies through special projects or individualized instruction methods.

- Technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

ACKNOWLEDGEMENTS

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AUTOMATED MANUFACTURING TECHNOLOGY

PROGRAM DESCRIPTION

Automated Manufacturing Technology is an instructional program that provides the student with technical knowledge and skills necessary for gaining employment as an automated manufacturing systems technician in maintenance diagnostics, engineering, or production in an automated manufacturing environment. The focus of this program is on computer controlled manufacturing with particular emphasis in the integration of programmable controllers, electronics, fluid power, instrumentation, and process control in the manufacturing process. Included is the ability to interface and maintain systems in a manufacturing application that involves material handling, CNC machining, parts assembly, and robotics control.

This curriculum is designed as a two-year technical program. The Associate of Applied Science Degree in Automated Manufacturing Technology will be awarded at the culmination of a minimum of 65 semester hours of satisfactory study. At the conclusion of the program, the student will have an opportunity to apply for the Engineering Fundamentals exam and become a Certified Manufacturing Technologist (CMfgT) or an Associate Certified Manufacturing Technologist (Associate CMfgT) through the Society of Manufacturing Engineers (SME).

ELECTRICITY/ELECTRONICS/RELATED ENGINEERING CLUSTER
AUTOMATED MANUFACTURING TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Electronics Technology**

FIRST YEAR

2 sch Fundamentals of Electronics (EET 1102)
3 sch Fundamentals of Robotics (ROT 1113)
4 sch DC Circuits (EET 1114)
3 sch Math/Science Elective
3 sch Computer Related Elective

15 sch

3 sch AC Circuits (EET 1123)
4 sch Solid State Devices and Circuits (EET 1314)
3 sch Systems Programming I (MFT 1123)
4 sch Principles of Automation I (MFT 1214)
4 sch Fluid Power (INT 1214)

18 sch

SECOND YEAR

3 sch Written Communications Elective
3 sch Social/Behavioral Science Elective
4 sch Principles of Automation II (MFT 2224)
3 sch Motor Control Systems (ELT 1413)
3 sch Industrial Robotics (ROT 1313)

16 sch

3 sch Oral Communications Elective
3 sch Humanities/Fine Arts Elective
4 sch Flexible Manufacturing Systems (MFT 2614)
6-7 sch Technical Electives

16-17 sch

* Students who lack entry level skills in math, English, science, etc., will be provided related studies.

** Baseline competencies are taken from the high school Electronics program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES

AUTOMATED MANUFACTURING TECHNOLOGY

4 sch	Introduction to Computers (CPT 1114)[1]	3 sch	Computer Upgrade and Repair (MFT 1613)
3 sch	Computer Fundamentals for Electricity/Electronics (EET 1613)[1]	3 sch	Statistical Process Control (MFT 2313)
3 sch	Approved Computer Programming Language[1]	3 sch	Computer Integrated Manufacturing (MFT 2413)
3 sch	Commercial and Industrial Wiring (ELT 1123)	3 sch	Data Acquisition and Communications (MFT 2513)
3 sch	Principles of CAD (DDT 1313)	3 sch	Automated Motion Control (MFT 2013)
3 sch	Fundamentals of Drafting (DDT 1113)	3 sch	Materials Requirement Planning (MFT 2113)
4 sch	Interfacing Techniques (EET 2514)	1-3 sch	Special Project [MFT 291(1-3)]
4 sch	Microprocessors (EET 1324)	1-6 sch	Supervised Work Experience [MFT 292(1-6)]
3 sch	Programmable Logic Controllers (ELT 2613)	4 sch	Electronic Communications (EET 2414)
4 sch	Calibration and Measurement Principles (INT 2214)	4 sch	Interfacing Techniques (EET 2514)
4 sch	Control Systems I (INT 2114)	4 sch	Control Systems II (INT 2124)

[1] May be selected as computer related elective

COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY

PROGRAM DESCRIPTION

Communications Electronics Repair Technology is an instructional program that prepares individuals to assemble, install, operate, and maintain communications equipment and systems; including one- and two-way communications systems, home entertainment systems, and other communications equipment. Instruction is included in the use and repair of the actual equipment.

Communications Electronics Repair Technology is an articulated certificate/technical program designed to provide advanced and technical skills to its graduates. Entrance into the postsecondary program is based upon mastery of baseline competencies skills from the high school Electronics program. Students entering the program without baseline competencies must successfully complete Introduction to Electronics Technology (EET 100(3-6)).

Technical programs in Communications Electronics Repair Technology require a minimum of 65 semester credit hours (sch) of instruction which includes a minimum academic core of 15 sch. In the technical program, students may elect to pursue specialized study in home entertainment or radio communications fields.

Certificate programs in Communications Electronics Repair Technology require a minimum of 32 semester credit hours of vocational-technical course work. Emphasis is placed on home entertainment system repair in the certificate program. The following courses are recommended for the certificate:

4 sch	DC Circuits (EET 1114)	3 sch	Video Systems (EET 2813)
3 sch	AC Circuits (EET 1123)	3 sch	Video Systems Repair Lab (CET 2823)
3 sch	Technical Elective		
4 sch	Digital Electronics (EET 1214)	4 sch	Electronic Communications (EET 2414)
4 sch	Solid State Devices and Circuits (EET 1314)	3 sch	Diagnostics and Troubleshooting Lab (CET 2223)
		3 sch	Video Recording Systems Lab (CET 2323)

ELECTRONICS/RELATED ENGINEERING CLUSTER
COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Electronics Technology**

FIRST YEAR

2 sch	Fundamentals of Electronics (EET 1102)	4 sch	Solid State Devices and Circuits (EET 1314)
4 sch	DC Circuits (EET 1114)	4 sch	Microprocessors (EET 1324)
4 sch	Digital Electronics (EET 1214)	6 sch	Technical Electives
3 sch	AC Circuits (EET 1123)	3 sch	Written Communications Elective
3 sch	Math/Science Elective		
16 sch		17 sch	

SECOND YEAR

4 sch	Electronic Communications (EET 2414)	3 sch	Diagnostics and Troubleshooting Lab (CET 2223)
4 sch	Linear Integrated Circuits (EET 2334)	6 sch	Technical Electives
3 sch	Video Systems (EET 2813)	3 sch	Social/Behavioral Science Elective
3 sch	Video Systems Repair Lab (CET 2823)	3 sch	Humanities/Fine Arts Elective
3 sch	Oral Communications Elective		
17 sch		15 sch	

* Students who lack entry level skills in math, English, science, etc., will be provided related studies.

** Baseline competencies are taken from the high school Electronics program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES

COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY

3 sch	Drafting for Electronic/Electrical Technology (EET 1713)
4 sch	Interfacing Techniques (EET 2514)
3 sch	Fundamentals of Fiber Optics (EET 2423)
3 sch	Advanced Electronic Communications (CET 2424)
3 sch	Satellite Systems (CET 1113)
3 sch	Video Recording Systems Lab (CET 2323)
1-3 sch	Special Project [CET 291(1-3)]
1-6 sch	Supervised Work Experience [CET 292(1-6)]

COMPUTER SERVICING TECHNOLOGY

PROGRAM DESCRIPTION

Computer Servicing Technology is an instructional program that prepares individuals to install, operate, maintain, service, and diagnose operational problems in computer systems arising from mechanical or electrical malfunctions in computer units or systems. Courses in the Computer Servicing Technology program describe the electrical circuits and mechanical devices used in computer construction and their combination into a total computer system.

Technical programs in Computer Servicing Technology require a minimum of 65 semester credit hours (sch). This total includes a minimum of 15 sch of academic core courses and 51 sch of vocational and technical courses. Recommended courses are shown as follows:

Certificate programs in Computer Servicing require a minimum of 32 semester credit hours of vocational and technical course work above the Baseline Skills level. The following courses are recommended for the certificate:

2 sch	Fundamentals of Electronics (EET 1102)	3 sch	Computer Servicing Lab I (CST 2113)
4 sch	DC Circuits (EET 1114)	4 sch	Interfacing Techniques (EET 2514)
4 sch	Digital Electronics (EET 1214)	3 sch	Failure Analysis (CST 1213)
4 sch	Microprocessors (EET 1324)	3 sch	Computer Servicing Lab II (CST 2123)
3 sch	AC Circuits (EET 1123)	4 sch	Linear Integrated Circuits (EET 2334)
4 sch	Solid State Devices & Circuits (EET 1314)		

ELECTRICITY/ELECTRONICS/RELATED ENGINEERING CLUSTER
COMPUTER SERVICING TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Electronics Technology**

FIRST YEAR

2 sch	Fundamentals of Electronics (EET 1102)	3 sch	AC Circuits (EET 1123)
4 sch	DC Circuits (EET 1114)	4 sch	Solid State Devices & Circuits (EET 1314)
4 sch	Digital Electronics (EET 1214)	4 sch	Microprocessors (EET 1324)
3 sch	Computer Related Elective	3 sch	Technical Elective
3 sch	Math/Science Elective	3 sch	Written Communications Elective
16 sch		17 sch	

SECOND YEAR

4 sch	Interfacing Techniques (EET 2514)	4 sch	Linear Integrated Circuits (EET 2334)
3 sch	Computer Servicing Lab I (CST 2113)	3 sch	Computer Servicing Lab II (CST 2123)
6 sch	Technical Electives	3 sch	Technical Electives
3 sch	Humanities/Fine Arts Elective	3 sch	Oral Communications Elective
		3 sch	Social/Behavioral Science Elective
16 sch		16 sch	

* Students who lack entry level skills in math, English, science, etc., will be provided related studies.

** Baseline competencies are taken from the high school Electronics program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES

COMPUTER SERVICING TECHNOLOGY

3 sch	Computer Fundamentals for Electronics/Electricity (EET 1613)'	3 sch	Video Systems (EET 2813)
4 sch	Introduction to Computers (CPT 1114)'	3 sch	Failure Analysis (CST 1213)
3 sch	Drafting for Electronic/Electrical Technology (EET 1713)	1-3 sch	Special Project [CST 291(1-3)]
		1-6 sch	Supervised Work Experience [CST 292(1-6)]

' May be selected as computer related elective

ELECTRICAL TECHNOLOGY

PROGRAM DESCRIPTION

The Postsecondary Electrical Technology program prepares individuals to install, operate, maintain, and repair electrically-energized systems such as residential, commercial, and industrial electric wiring, and DC and AC motors, controls, and electrical distribution panels. Instruction in the use of test equipment is included.

PROGRAM REQUIREMENTS

Electrical Technology is an articulated technical program designed to provide its students with technical skills. Entry into the programs based upon mastery of skills which are taught in secondary Electrician programs. Students who do not possess such skills must complete additional course work in order to graduate from the program. The technical program consists of essential skills which may be obtained in a secondary program or at the community/junior college and technical skills and academics which must be obtained at the community/junior college level.

The standard curriculum for Electrical Technology is based upon the standards as reviewed in other documents and a revision team composed of selected instructors. The listing of tasks served as a baseline data for the revision of this curriculum. The task list used in this curriculum is based upon the following assumptions:

1. In all areas, appropriate theory, safety, and support instruction will be provided for each task. It is essential that all instruction has included use of appropriate tools, testing and measuring instruments needed to accomplish certain tasks. It is also assumed that each student has received instruction to locate and use current reference and materials from industry publications which present manufacturers' recommended or required specifications and procedures for doing the various tasks.
2. The individual program should have written and detailed evaluation standards for each task covered in the curriculum. Learning progress of students should be monitored and evaluated against these stated standards. A system should be in place which informs all students of their progress throughout the program.
3. It is recognized that individual courses will differ across the technical programs. The development of appropriate learning activities and tests will be the responsibility of the individual program.
4. These standards require that tasks contained in the list be included in the program to validate that the program is meeting the needs of the electrical industry.

The curriculum for Electrical Technology is designed to serve as the core curriculum for approximately 75 percent of each course at the postsecondary level. The remaining 25 percent of each course is to be added at the local level based upon needs of students and area employers.

The technical program in Electrical Technology requires a minimum of 65 semester credit hours (sch) beyond the baseline competencies. Fifteen semester credit hours of academic core courses are included in this minimum.

Certificate programs in Electrical Technology require a minimum of 32 semester hours credit. The following courses are recommended for the certificate:

2 sch	Fundamentals of Electricity (ELT 1102)
4 sch	DC Circuits (EET 1114)
3 sch	AC Circuits (EET 1123)
3 sch	Residential/Light Commercial Wiring (ELT 1113)
3 sch	Commercial and Industrial Wiring (ELT 1123)
3 sch	Branch Circuit and Service Entrance Calculations (ELT 1253)
3 sch	Blueprint Reading/Planning in Residential Installation (ELT 1263)
3 sch	Switching Circuits for Residential, Commerical, and Industrial Applications (ELT 1273)
3 sch	Electrical Power (ELT 1213)
3 sch	Motor Control Systems (ELT 1413)
4 sch	Solid State Devices and Circuits (EET 1314)
3 sch	Programmable Logic Controllers (ELT 2613)
4 sch	Solid State Motor Control (ELT 2424)
3 sch	Motor Maintenance and Troubleshooting (ELT 1223)
1-3 sch	Special Project (ELT 291[1-3])
3 sch	Estimating the Cost of a Residential Installation (ELT 1283)

ELECTRICITY/ELECTRONICS/RELATED ENGINEERINGCLUSTER
ELECTRICAL TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Electrical Technology**

FIRST YEAR

2 sch	Fundamentals of Electricity (ELT 1102)	3 sch	Commercial and Industrial Wiring (ELT 1123)
4 sch	DC Circuits (EET 1114)	3 sch	Motor Maintenance and Troubleshooting (ELT 1223)
3 sch	AC Circuits (EET 1123)	3 sch	Motor Control Systems (ELT 1413)
3 sch	Residential/Light Commercial Wiring (ELT 1113)	4 sch	Solid State Devices and Circuits (EET 1314)
3 sch	Electrical Power (ELT 1213)	3 sch	Math/Science Elective
3 sch	Technical Elective		
18 sch		16 sch	

SECOND YEAR

3 sch	Programmable Logic Controllers (ELT 2613)	9 sch	Technical Electives
4 sch	Solid State Motor Control (ELT 2424)	3 sch	Oral Communications Elective
3 sch	Computer Related Elective	3 sch	Social/Behavioral Science Elective
3 sch	Written Communications Elective	15 sch	
3 sch	Humanities/Fine Arts Elective		
16 sch			

* Students who lack entry level skills in math, English, science, etc., will be provided related studies.

** Baseline competencies are taken from the high school Electrician program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES

ELECTRICAL TECHNOLOGY

3 sch	Drafting for Electronic/ Electrical Technology (EET 1713)
3 sch	Fundamentals of Fiber Optics (EET 2423)
3 sch	Computer Fundamentals for Electronics/Electricity (EET 1613)[1]
4 sch	Introduction to Computers (CPT 1114)[1]
3 sch	Branch Circuit and Service Entrance Calculations (ELT 1253)
3 sch	Blueprint Reading/Planning in Residential Installation (ELT 1263)
3 sch	Approved Computer Programming Language[1]
1-3 sch	Special Project [ELT 291(1-3)]
1-6 sch	Supervised Work Experience [ELT 292(1-6)]
3 sch	Switching Circuits for Residential, Commerical, and Industrial Applications (ELT 1273)
3 sch	Estimating the Cost of a Residential Installation (ELT 1283)

[1] May be selected as computer related elective

ELECTRONICS TECHNOLOGY

PROGRAM DESCRIPTION

Electronics Technology is an instructional program which prepares individuals to support electrical engineers and other professionals in the design, development, and testing of electrical circuits, devices, and systems. Included is instruction in model and prototype development and testing; systems analysis and integration, including design, development of corrective and preventive maintenance techniques; application of engineering data; and the preparation of reports and test results.

The purpose of the Electronics Technology curriculum is to provide instruction necessary for a student to become a competent electronic technician. A graduate of this curriculum will be eligible for entry level employment into any of the options in electronics and will be capable of correlating the activities of scientific research, engineering, and production for a wide variety of occupational fields. A graduate of the Electronics Technology curriculum will possess the capability of working and communicating directly with engineers, scientist, and other technical personnel in their specialized area.

PROGRAM REQUIREMENTS

Electronics Technology is an articulated technical program designed to provide its students with technical skills. Entry into the postsecondary program is based upon mastery of skills which are taught in the secondary Electronics programs. Students who do not possess such skills must complete additional course work in order to graduate from the program. The technical program consists of essential skills which may be obtained in a secondary program or at the community/junior college and technical skills and academics which must be obtained at the community/junior college level.

The curriculum for Electronics Technology is based upon the standards as developed by the Electronic Industries Association and the Electronic Industries Foundation (June 1994). These organizations developed a project which lead to a publication, Raising the Standard, of the essential skills needed by entry level employees within the electronic industry. The listing of tasks within this document served as baseline data for the revision of the curriculum. The task list used in the curriculum is based upon the following assumptions:

1. In all areas, appropriate theory, safety, and support instruction will be provided for each task. It is essential that all instruction has included use of appropriate tools, testing and measuring instruments needed to accomplish certain tasks. It is also assumed that each student has received instruction to locate and use current reference and materials from industry publications which present

manufacturers' recommended or required specifications and procedures for doing the various tasks.

2. The individual program should have written and detailed evaluation standards for each task covered in the curriculum. Learning progress of students should be monitored and evaluated against these stated standards. A system should be in place which informs all students of their progress throughout the program.
3. It is recognized that individual courses will differ across the technical programs. The development of appropriate learning activities and tests will be the responsibility of the individual program.
4. These national standards require that tasks contained in the list be included in the program to validate that the program is meeting the needs of the electronic industry.

The standard curriculum for Electronics Technology is designed to serve as the core curriculum for approximately 75 percent of each course at the postsecondary level. The remaining 25 percent of each course is to be added at the local level based upon needs of students and area employers.

Technical programs in Electronics Technology requires a minimum of 64 semester credit hours (sch) beyond the essential skills level. Fifteen semester credit hours of academic core courses are included in this minimum.

Certificate programs in Electronics Technology require a minimum of 32 semester hours credit. The following courses are recommended for the certificate:

2 sch	Fundamentals of Electronics (EET 1102)
4 sch	DC Circuits (EET 1114)
4 sch	Digital Electronics (EET 1214)
3 sch	AC Circuits (EET 1123)
4 sch	Solid State Devices and Circuits (EET 1314)
4 sch	Microprocessors (EET 1324)
4 sch	Linear Integrated Circuits (EET 2334)
4 sch	Electronic Communications (EET 2414)
4 sch	Interfacing Techniques (EET 2514)
1-3 sch	Special Project (EET 291[1-3])
1-6 sch	Supervised Work Experience (EET 292 [1-6])

ELECTRICITY/ELECTRONICS/RELATED ENGINEERING CLUSTER
ELECTRONICS TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Electronics Technology**

FIRST YEAR

2 sch	Fundamentals of Electronics (EET 1102)	3 sch	AC Circuits (EET 1123)
4 sch	DC Circuits (EET 1114)	4 sch	Solid State Devices and Circuits (EET 1314)
4 sch	Digital Electronics (EET 1214)	4 sch	Microprocessors (EET 1324)
3 sch	Computer Related Elective	3 sch	Technical Elective
3 sch	Math/Science Elective	3 sch	Written Communications Elective
16 sch		17 sch	

SECOND YEAR

4 sch	Linear Integrated Circuits (EET 2334)	4 sch	Interfacing Techniques (EET 2514)
4 sch	Electronics Communications (EET 2414)	6 sch	Technical Electives
4 sch	Technical Electives	3 sch	Oral Communications
3 sch	Humanities/Fine Arts Elective	3 sch	Social/Behavioral Science Elective
15 sch		16 sch	

* Students who lack entry level skills in math, English, science, etc., will be provided related studies.

** Baseline competencies are taken from the high school Electronics program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES

ELECTRONICS TECHNOLOGY

3 sch	Drafting for Electronic/Electrical Technology (EET 1713)
4 sch	Solid State Motor Control (ELT 2424)
3 sch	Fundamentals of Robotics (ROT 1113)
3 sch	Programmable Logic Controllers (ELT 2613)
4 sch	Introduction to Computers (CPT 1114)†
3 sch	Industrial Hydraulics (ROT 1213)
3 sch	Industrial Pneumatics (ROT 1223)
4 sch	Fluid Power (INT 1214)
3 sch	Computer Fundamentals for Electronics/Electricity (EET 1613)†
3 sch	Systems Programming I (MFT 1123)
3 sch	Approved Computer Programming Language†
3 sch	Computer Servicing Lab I (CST 2113)
1-3 sch	Special Project [EET 291(1-3)]
1-6 sch	Supervised Work Experience [EET 292(1-6)]
3 sch	Video Systems (EET 2813)
3 sch	Fundamentals of Fiber Optics (EET 2423)
3 sch	Computer Servicing Lab II (CST 2123)†
3 sch	Motor Control Systems (ELT 1413)
3 sch	Motor Maintenance and Troubleshooting (ELT 1223)
3 sch	Electrical Power (ELT 1213)
3 sch	Commercial and Industrial Wiring (ELT 1123)

† May be selected as computer related elective

INSTRUMENTATION TECHNOLOGY

PROGRAM DESCRIPTION

The Instrumentation Technology curriculum provides knowledge and skills necessary to function at the technician level in the area of instrumentation. This two-year program prepares students to repair, calibrate, and install industrial instrumentation (i.e., pressure, level, flow, temperature and indicators, transmitters, sensors, transducers, etc.), to align and tune controllers, and adjust valves.

Included is instruction in the fields of electricity, electronics, mechanics, pneumatics, and hydraulics as they pertain to the principles of control, recording systems, automated devices, and the calibration of instrumentation units or systems.

This is a two-year technical program which allows the successful graduate to be awarded an associate of applied science degree and to take the examination for Level I certification offered by the National Institute for Certification in Engineering Technologies (NICET). A minimum of 64 semester credit hours of coursework is required to complete the program.

ELECTRONICS/RELATED ENGINEERING CLUSTER
INSTRUMENTATION TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Electronics Technology**

FIRST YEAR

2 sch	Fundamentals of Electronics (EET 1102)	4 sch	Fluid Power (INT 1214)
4 sch	DC Circuits (EET 1114)	3 sch	AC Circuits (EET 1123)
4 sch	Digital Electronics (EET 1214)	3 sch	Motor Control Systems (ELT 1413)
3 sch	Math/Science Elective	4 sch	Solid State Devices and Circuits (EET 1314)
3 sch	Computer Related Elective	3 sch	Written Communications Elective
16 sch		17 sch	

SECOND YEAR

4 sch	Control Systems I (INT 2114)	4 sch	Calibration and Measurement Principles (INT 2214)
3 sch	Technical Elective	4 sch	Control Systems II (INT 2124)
3 sch	Oral Communications Elective	3-4 sch	Technical Elective
3 sch	Programmable Logic Controllers (ELT 2613)	3 sch	Humanities/Fine Arts
3 sch	Social/Behavioral Science Elective	1 sch	Special Project (INT 2911) OR
16 sch		1 sch	Supervised Work Experience (INT 2921)
		15-16 sch	

* Students who lack entry level skills in math, English, science, etc., will be provided related studies.

** Baseline competencies are taken from the high school Electronics program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES

INSTRUMENTATION TECHNOLOGY

3 sch	Drafting for Electronic/Electrical Technology (EET 1713)	4 sch	Principles of Automation I (MFT 1214)
4 sch	Linear Integrated Circuits (EET 2334)	3 sch	Industrial Robotics (ROT 1313)
4 sch	Solid State Motor Control (ELT 2424)	4 sch	Introduction to Computers (CPT 1114)'
3 sch	Fundamentals of Robotics (ROT 1113)	3 sch	Computer Fundamentals for Electronics/Electricity' (EET 1613)'
3 sch	Fundamentals of Fiber Optics (EET 2423)	3 sch	Approved Computer Programming Language'
3 sch	Fundamentals of Drafting (DDT 1113)	1-3 sch	Special Project (INT 291[1-3])
3 sch	Fundamentals of Instrumentation (INT 1113)	1-6 sch	Supervised Work Experience (INT 292[1-3])

' May be selected as computer related elective

ROBOTICS TECHNOLOGY

PROGRAM DESCRIPTION

Robotics Technology is an instructional program that provides the student with technical knowledge and skills necessary for gaining employment as an industrial robotics/automated systems technician. Robotics/automated systems technicians are technical specialists with broad-based electro-mechanical skills who are familiar with electronic, mechanical, and computer-aided design, robotics, computer numerical control, or processing equipment and can set up automatic machines that work together as part of a total automated system. In their area of specialization they can install, set up, troubleshoot, integrate, program, modify, test, operate, and repair systems and components. They are field service, installation, or service technicians. They may work under the supervision of an engineer, as a member of a team, or supervise other technicians.

The Associate of Applied Science Degree in Robotics Technology will be awarded at the culmination of a minimum of 64 semester hours of satisfactory study. At the conclusion of the program, the student will have an opportunity to apply for the Engineering Fundamentals exam and become a Certified Manufacturing Technologist (CMfgT) or an Associate Certified Manufacturing Technologist (Associate CMfgT) through the Society of Manufacturing Engineers (SME).

ELECTRONICS/RELATED ENGINEERING CLUSTER
ROBOTICS TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Electronics Technology**

FIRST YEAR

2 sch	Fundamentals of Electronics (EET 1102)	3 sch	AC Circuits (EET 1123)
4 sch	DC Circuits (EET 1114)	4 sch	Solid State Devices and Circuits (EET 1314)
3 sch	Fundamentals of Robotics (ROT 1113)	3 sch	Written Communications Elective
3 sch	Industrial Hydraulics (ROT 1213)†	3 sch	Industrial Pneumatics (ROT 1223)†
4 sch	Digital Electronics (EET 1214)	3 sch	Industrial Robotics (ROT 1313)
16 sch		16 sch	

SECOND YEAR

3 sch	Servo Control Systems (ROT 2423)	4 sch	Linear Integrated Circuits (EET 2334)
3 sch	Electrical Power (ELT 1213)	3 sch	Automated Manufacturing Controls (ROT 2413)
3 sch	Motor Control Systems (ELT 1413)	3 sch	Programmable Logic Controllers (ELT 2613)
3 sch	Technical Elective	3 sch	Social/Behavioral Science Elective
3 sch	Oral Communications Elective	3 sch	Humanities/Fine Arts Elective
3 sch	Math/Science Elective	16 sch	
18 sch			

* Students who lack entry level skills in math, English, science, etc., will be provided related studies.

** Baseline competencies are taken from the high school Electronics program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

* Fluid Power (INT 1214) may substitute for Industrial Hydraulics (ROT 1213) and Industrial Pneumatics (ROT 1223) with the permission of the instructor.

TECHNICAL ELECTIVES

ROBOTICS TECHNOLOGY

3 sch	Commercial and Industrial Wiring (ELT 1123)	2 sch	Fundamentals of Electricity (ELT 1102)
3 sch	Mechanical Systems (ROT 2613)	3 sch	Advanced Programmable Logic Controllers (ELT 2623)
4 sch	Interfacing Techniques (EET 2514)	3 sch	Motor Maintenance and Troubleshooting (ELT 1223)
3 sch	Fundamentals of Drafting (DDT 1113)	1-3 sch	Special Project [ROT 291(1-3)]
4 sch	Microprocessors (EET 1324)	1-6 sch	Supervised Work Experience [ROT 292(1-6)]
4 sch	Solid State Motor Control (ELT 2424)	4 sch	Fluid Power (INT 1214)
3 sch	Systems Programming I (MFT 1123)		

TELECOMMUNICATIONS TECHNOLOGY

PROGRAM DESCRIPTION

This two-year program is designed to prepare students for a wide range of technical positions within the Telecommunications industry. Specific preparation is in modes, techniques, and mediums of voice, and data transmissions and reception. Emphasis is on the telephone instrument, key systems, analog and digital voice communications, data communications, fiber optics applications, satellite and microwave communications and integrated services digital network (ISDN). Graduates will be qualified to help select, install, operate, maintain, troubleshoot, and repair telecommunications systems. An Associate of Applied Science Degree is awarded upon completion of a minimum of 64 semester credit hours of course work.

ELECTRONICS/RELATED ENGINEERING CLUSTER
TELECOMMUNICATIONS TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Electronics Technology**

FIRST YEAR

2 sch	Fundamentals of Electronics (EET 1102)	4 sch	Fundamentals of Telecommunications (TCT 1114)
3 sch	AC Circuits (EET 1123)	4 sch	Solid State Devices and Circuits (EET 1314)
4 sch	DC Circuits (EET 1114)	4 sch	Telephone Systems (TCT 2214)
3 sch	Computer Related Elective	4 sch	Digital Electronics (EET 1214)
3 sch	Math/Science Elective		
15 sch		16 sch	

SECOND YEAR

7-8 sch	Technical Elective	4 sch	Digital Communications (TCT 2324)
3 sch	Social/Behavioral Science Elective	3-4 sch	Technical Elective
3 sch	Fundamentals of Fiber Optics (EET 2423)	3 sch	Oral Communications Elective
3 sch	Written Communications Elective	3 sch	Humanities/Fine Arts Elective
		4 sch	Microwave and Satellite Systems (TCT 2414)
16-17 sch		17-18 sch	

* Students who lack entry level skills in math, English, science, etc., will be provided related studies.

** Baseline competencies are taken from the high school Electronics program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

TECHNICAL ELECTIVES

TELECOMMUNICATIONS TECHNOLOGY

3 sch	Computer Fundamentals for Electronics/Electricity (EET 1613)'	3 sch	Statistical Process Control (MFT 2313)
4 sch	Introduction to Computers (CPT 1114)'	1-3 sch	Special Project (TCT 291[1-3])
3 sch	Approved Computer Programming Language Course'	1-6 sch	Supervised Work Experience (TCT 292 [1-6])
4 sch	PBX Systems (TCT 2224)	4 sch	Network Systems (TCT 2424)
4 sch	Electronic Communications (EET 2414)	4 sch	Linear Integrated Circuits (EET 2334)
3 sch	Drafting for Electronic/Electrical Technology (EET 1713)	4 sch	Microprocessers (EET 1324)
		4 sch	Fundamentals of Ditigal Communications (TCT 2314)

' May be selected as computer related elective

POSTSECONDARY TRADE AND RELATED TECHNOLOGY PROGRAMS

ELECTRICITY/ELECTRONICS/RELATED ENGINEERING PROGRAMS

LAYOUT OF PROGRAMS AND COURSES

Courses (X = Required Course, E = Elective)	MFT	CET	CST	ELT	EET	INT	RQT	TCT
AUTOMATED MANUFACTURING TECHNOLOGY (MFT)								
Automated Motion Control	E							
Computer Integrated Manufacturing	E							
Computer Upgrade and Repair	E							
Data Acquisition and Communications	E							
Flexible Manufacturing Systems	X							
Principles of Automation I	X					E		
Principles of Automation II	X							
Materials Requirement Planning (MRP)	E							
Special Project	E							
Statistical Process Control	E							E
Supervised Work Experience	E							
Systems Programming I	X				E			
COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY (CET)								
Advanced Electronic Communications		E						
Diagnostics and Troubleshooting Lab		X						
Satellite Systems		E						
Special Project		E						
Supervised Work Experience		E						
Video Recording Systems Lab		E						
Video Systems Repair Lab		X						

Courses (X = Required Course, E = Elective)	MFT	CET	CST	ELT	EET	INT	ROT	TCT
COMPUTER SERVICING TECHNOLOGY (CST)								
Computer Servicing Lab I			X		E			
Computer Servicing Lab II			X		E			
Failure Analysis			E					
Special Project			E					
Supervised Work Experience			E					
ELECTRICAL TECHNOLOGY (ELT)								
Advanced Programmable Logic Controllers							E	
Commercial and Industrial Wiring	E			X	E		E	
Electrical Power				X	E		X	
Fundamentals of Electricity				X			E	
Motor Control Systems	X			X	E	X	X	
Motor Maintenance and Troubleshooting				X	E		E	
Programmable Logic Controllers	E			X	E	X	X	
Residential/Light Commercial Wiring				X				
Solid State Motor Control				X	E	E	E	
Special Project				E				
Supervised Work Experience				E				
Branch Circuit and Service Entrance Calculations				E				
Blueprint Reading/Planning the Residential Installation				E				
Switching Circuits for Residential, Commerical, and Industrial Application				E	E			
Estimating the Cost of a Residential Installation				E				

Courses (X = Required Course, E = Elective)	MFT	CET	CST	ELT	EET	INT	ROT	TCT
ELECTRONICS TECHNOLOGY (EET)								
AC Circuits	X	X	X	X	X	X	X	X
DC Circuits	X	X	X	X	X	X	X	X
Digital Electronics		X	X		X	X	X	X
Electronic Communications	E	X			X			E
Drafting for Electronics/Electrical Technology		E	E	E	E	E		E
Interfacing Techniques	E	E	X		X		E	
Fundamentals of Electronics	X	X	X		X	X	X	X
Fundamentals of Fiber Optics		E		E	E	E		X
Linear Integrated Circuits		X	X		X	E	X	E
Microprocessors	E	X	X		X		E	E
Solid State Devices and Circuits	X	X	X	X	X	X	X	X
Special Project					E			
Supervised Work Experience					E			
Computer Fundamentals for Electronics/Electricity	E	E	E	E	E	E	E	
Video Systems		X	E		E			
INSTRUMENTATION TECHNOLOGY (INT)								
Calibration and Measurement Principles	E					X		
Control Systems I	E					X		
Control Systems II	E					X		
Fluid Power	X				E	X	E	
Fundamentals of Instrumentation						E		
Special Project						E		
Supervised Work Experience						E		

Courses (X = Required Course, E = Elective)	MET	CET	CST	ELT	EET	INT	ROT	TCT
ROBOTICS TECHNOLOGY (ROT)								
Automated Manufacturing Controls							X	
Industrial Hydraulics					E		X	
Industrial Pneumatics					E		X	
Industrial Robotics	X					E	X	
Fundamentals of Robotics	X				E	E	X	
Mechanical Systems							E	
Servo Control Systems							X	
Special Project							E	
Supervised Work Experience							E	
TELECOMMUNICATIONS TECHNOLOGY (TCT)								
Fundamental of Digital Communications								E
Digital Communications								X
Fundamentals of Telecommunications								X
Microwave and Satellite Systems								X
PBX Systems								E
Special Project								E
Supervised Work Experience								E
Telephone Systems								X
Network Systems								E
RELATED VOCATIONAL-TECHNICAL								
BASIC Programming Language	E			E	E	E		E
Fundamentals of Drafting	E					E	E	
Introduction to Computers	E		E	E	E	E		E
Principles of CAD	E							

SECTION I:

BASELINE COMPETENCIES

BASELINE COMPETENCIES FOR ELECTRICAL PROGRAMS

The following competencies and suggested objectives are taken from the publication *Mississippi Curriculum Framework for Electrician*. These competencies and objectives represent the baseline which was used to develop the community/junior college Electrical Technology courses. Students enrolled in postsecondary courses should either (1) have documented mastery of these competencies, or (2) be provided with these competencies before studying the advanced competencies in the Electrical Technology program.

Baseline competencies may be integrated into existing courses in the curriculum or taught as special "Introduction" courses. The "Introduction" courses may be taught for up to six semester hours of institutional credit and may be divided into two courses. If the Baseline Competencies are to be taught as "Introduction" courses, each course should be at least 3 credit hours. The following course number(s) and description should be used:

Course Name(s): Introduction to Electrical Technology, Introduction to Electrical Technology I, or Introduction to Electrical Technology II

Course Abbreviation(s): EET 100(3-6), EET 1013, EET 1023

Classification: Vocational-Technical Core

Description: These courses contain the baseline competencies and suggested objectives from the high school Electrician curriculum which directly related to the community college Electrical Technology program. The courses are designed for students entering the community college who have had no previous training or documented experience in the field. (3-6 semester hours based upon existing skills for each student. May be divided into 2 courses for a maximum total of 6 hours of institutional credit.)

Competencies and Suggested Objectives:

1. Describe local program and vocational center policies and procedures.
   a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

2. Describe employment opportunities and responsibilities for electronics technicians and related employees.
   a. Describe employment opportunities available for electricians, electronics technicians, and electrical related employees including potential earnings, employee benefits, job availability, possible places of employment, working conditions, and educational requirements.
   b. Describe basic employee responsibilities including punctuality, physical requirements, customer relations, following directions, job safety, and entry level skills.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
3. Describe personal and general safety rules for working in a shop/lab and industry.
   a. Describe personal safety rules for working in a shop/lab and industry including work clothing, protective clothing, safety glasses, and hearing, feet, hand, and head protection.
   b. Describe general workplace safety rules including shop/lab (work site) organization.
   c. Describe the proper use of fire extinguishers and classes of fires including class A (trash and wood), B (petroleum products), C (energized electrical), and D (combustible metals).
   d. Identify standard industry Safety Color Codes.
   e. Describe procedures for safely handling heavy objects including using lifting devices, having straight back, lifting with legs, getting help for heavy objects, holding objects close to the body, sizing up load, and holding feet close together.
   f. Describe safety practices for using climbing devices including ladders, scaffolding, and climbing belts.
   g. Describe the Occupational Safety and Health Act (OSHA) and its effect on the workplace.

   Related Academic Topics (See Appendix A): C2, C4
   Workplace Skills (See Appendix B): WP5
4. Describe basic electrical safety practices.
   a. Describe factors to consider in storing and/or disposing of hazardous materials including PCB's in old transformers and capacitors, volatile liquids, battery acid, explosive gases, refrigerants, and POL products.
   b. Identify hazardous materials that may be found on a job site and describe procedures for handling/avoidance or removal of materials including asbestos, PCB's, POL products, refrigerants, flammable materials, and smoke.
   c. Interpret a Materials Safety Data Sheet (MSDS).
   d. Describe basic electrical safety practices including removal of jewelry and metal objects from body, probing techniques, using insulated gloves and boots, grounding, and personal safety devices.

e. Describe hazards of electrical shock including effects of current, shock avoidance techniques, and shock treatment procedures.
f. Describe accident procedures including getting help, basic first aid, cardiopulmonary resuscitation (CPR), and accident report form.
g. Describe basic electric circuit safety methods including proper grounding, importance of third wire, and ground fault interrupters.
h. Describe the operation of current overload devices including fuses and circuit breakers.

Related Academic Topics (See Appendix A): C1, C4, C5, S5, S6, S8
Workplace Skills (See Appendix B): WP5, WP6

5. State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided students in electronics by the Vocational Industrial Clubs of America (VICA).
   a. State procedures of leadership used in organizational meetings to reach an agreement in an orderly manner including procedures for gaining recognition in a meeting and conducting a VICA Club meeting.
   b. Describe the purposes of VICA including leadership development, personal development, and skills competition.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3, WP6
6. Identify desirable personal behavior and characteristics for use in the electronic occupations.
   a. Identify desirable personality traits to apply when serving the public including politeness, cheerfulness, enthusiasm, efficiency, competency, friendliness, self-confidence, honesty, and integrity.
   b. Identify desirable personality traits to apply when communicating with employees, supervisors, and other employees including effective communication skills, positive attitude, honesty, integrity, loyalty, team commitment, cooperation, and ability to follow oral and written instructions.
   c. Identify desirable characteristics of the personal work ethic to apply in electronics including attendance, promptness, desire to achieve, loyalty, competent performance as required by employer, effective customer relations, cooperation, and obedience to rules and regulations.

   Related Academic Topics (See Appendix A): C4, C5, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
7. Identify legal requirement for participation in electronics occupations.
   a. Describe ways to avoid legal liability problems in electronics including using equipment approved by national testing organization; installing wiring to NEC, local codes, and customer specifications; and maintaining license and bonding.

   Related Academic Topics (See Appendix A): C3, C4, C6
   Workplace Skills (See Appendix B): WP4, WP6

8. Describe the terms and scientific principles associated with direct current electricity.
   a. Define terms associated with the nature of matter including physical characteristics of matter (elements, compounds, atoms, electrons, protons, and neutrons).
   b. Describe laws of electrical charges including like and unlike charges.
   c. Identify electrical materials including conductors, insulators, and semiconductors.
   d. Describe methods of generating electricity including solar, chemical, mechanical, and thermal.
   e. Describe the principles and operation of batteries.
   f. Describe basic theories of current flow including electron and conventional flow methods.
   g. Describe DC circuit parameters including voltage, power, current, and resistance.
   h. Identify resistor types and values using standard resistor color codes and alphanumeric codes.
   i. Perform basic engineering notation calculations including conversion, adding, subtracting, multiplying, and dividing.
   j. Identify DC circuit schematic symbols.

   Related Academic Topics (See Appendix A): C1, C5, C6, M1, M4, S6, S8
   Workplace Skills (See Appendix B): WP1, WP2, WP4, WP6
9. Create circuits and measure DC electricity using the multimeter.
   a. Describe and demonstrate use of a multimeter including measuring voltage, current, and resistance.
   b. Demonstrate use of Ohm's Law to calculate circuit parameters for a series circuit including voltage, current, resistance, and power.
   c. Draw and construct a series circuit with a minimum of three resistances.
   d. Calculate and measure circuit parameters for a series circuit.
   e. Demonstrate use of Ohm's Law to calculate circuit parameters for a parallel circuit including voltage, current, resistance, and power.
   f. Draw and construct a parallel circuit with a minimum of three resistances.
   g. Calculate and measure circuit parameters for a parallel circuit.
   h. Demonstrate use of Ohm's Law to calculate circuit parameters for a series-parallel circuit including voltage, current, resistance, and power.
   i. Draw and construct a series-parallel circuit with a minimum of three resistances.
   j. Calculate and measure circuit parameters for a series-parallel circuit.

   Related Academic Topics (See Appendix A): C1, C4, C6, M1, M4, S6, S8
   Workplace Skills (See Appendix B): WP4, WP5, WP6
10. Describe the principles of magnetism and electromagnetic properties.
   a. Describe the principles of magnetism including magnetic fields, polarities, core materials, permeability, motor action, induced current, and associated laws.

b. Describe the principles of electromagnetic properties including magnetic fields, polarities, core materials, permeability, motor action, induced current, and associated laws.
c. Construct a simple electromagnet, including use of copper windings and a metal rod.

Related Academic Topics (See Appendix A): C1, C2, C4, C5, M1, M4, S6, S8
Workplace Skills (See Appendix B): WP4, WP5, WP6

11. Describe the terms and scientific principles associated with alternating current electricity.
    a. Describe principles of AC generation including sine wave characteristics and magnetic induction.
    b. Define terms associated with AC voltage including AC frequency, period, and time.
    c. Describe sources of AC voltage including power plants (hydroelectric, fossil fuel, solar, wind, and nuclear power) and generators.
    d. Describe distribution route and components used from power plant to home or business including transmission lines, transformers, substations, and service entrances.
    e. Describe the properties and characteristics of inductors including inductance, physical properties, DC and AC characteristics, units, current, and frequency.
    f. Describe the properties and characteristics of transformers including rating, types, uses, turns ratio, and connections.
    g. Describe properties and characteristics of capacitors including capacitance, physical properties, DC and AC characteristics, units, and reactance.
    h. Describe differences in phases in electrical power supply, including single-phase, and polyphase.

    Related Academic Topics (See Appendix A): C1, C2, C4, C5, M1, M2, S5, S8
    Workplace Skills (See Appendix B): WP2, WP5, WP6

12. Display and measure AC waveforms using the oscilloscope and function generator.
    a. Demonstrate the use of an oscilloscope including safety and measurement of DC and AC voltages and time.
    b. Demonstrate the use of a function generator including safety, square wave, sine wave, sawtooth wave, frequency, and amplitude.

    Related Academic Topics (See Appendix A): C2, C4, C5, M2, M4, S5, S8
    Workplace Skills (See Appendix B): WP1, WP4, WP5

13. Describe and construct series and parallel circuits.
    a. Draw and construct a series resistive circuit, calculating parameters and discussing phase relationship.
    b. Draw and construct a parallel resistive circuit, calculating parameters and discussing phase relationship.

c. Draw and construct a series inductive circuit including calculating parameters and time and voltage measurement in a circuit with two inductors.
d. Draw and construct a parallel inductive circuit including calculating parameters and time and voltage measurement in a circuit with two inductors.
e. Draw and construct a series RL circuit including calculating parameters and time and voltage measurement.
f. Draw and construct a parallel RL circuit including calculating parameters and time and voltage measurement.
g. Draw and construct a series capacitive circuit including calculating parameters and time and voltage measurement of a circuit with two capacitors.
h. Draw and construct a parallel capacitive circuit including calculating parameters and time and voltage measurement of a circuit with two capacitors.
i. Draw and construct a series RC circuit including calculating parameters and time and voltage measurement.
j. Draw and construct a parallel RC circuit including calculating parameters and time and voltage measurement.
k. Draw RL and RC time constants including calculating parameters and time and voltage measurement.
l. Draw and construct a series RCL circuit including calculating parameters and time and voltage measurement.
m. Draw and construct a parallel RCL circuit including calculating parameters and time and voltage measurement.
n. Describe series and parallel resonance.

Related Academic Topics (See Appendix A): C2, C4, C5, M2, M4, S5, S8
Workplace Skills (See Appendix B): WP1, WP4, WP5

14. Describe local program and vocational center policies and procedures.
    a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations.

Related Academic Topics (See Appendix A): C1, C4, C6
Workplace Skills (See Appendix B): WP2, WP3, WP6

15. Describe employment opportunities and responsibilities for electricians and related employees.
    a. Describe employment opportunities available for electricians, electronics technicians, and electrical related employees including potential earnings, employee benefits, job availability, possible places of employment, working conditions, and educational requirements.

b. Describe basic employee responsibilities including punctuality, physical requirements, customer relations, following directions, job safety, and entry level skills.

Related Academic Topics (See Appendix A): C1, C4, C6
Workplace Skills (See Appendix B): WP2, WP3, WP6

16. Describe personal and general safety rules for working in a shop/lab and industry.
    a. Describe personal safety rules for working in a shop/lab and industry including work clothing, protective clothing, safety glasses, and hearing, feet, hand, and head protection.
    b. Describe general workplace safety rules including shop/lab (work site) organization.
    c. Describe the proper use of fire extinguishers and classes of fires including class A (trash and wood), B (petroleum products), C (energized electrical), and D (combustible metals).
    d. Identify standard industry Safety Color Codes.
    e. Describe procedures for safely handling heavy objects including using lifting devices, having straight back, lifting with legs, getting help for heavy objects, holding objects close to the body, sizing up load, and holding feet close together.
    f. Describe safety practices for using climbing devices including ladders, scaffolding, and climbing belts.
    g. Describe the Occupational Safety and Health Act (OSHA) and its effect on the workplace.
    h. Identify the publisher, purpose, and application of the NEC.

    Related Academic Topics (See Appendix A): C2, C4
    Workplace Skills (See Appendix B): WP5

17. Describe basic electrical safety practices.
    a. Describe factors to consider in storing and/or disposing of hazardous materials including PCB's in old transformers and capacitors, volatile liquids, battery acid, explosive gases, refrigerants, and POL products.
    b. Identify hazardous materials that may be found on a job site and describe procedures for handling/avoidance or removal of materials including asbestos, PCB's, POL products, refrigerants, flammable materials, and smoke.
    c. Interpret a Materials Safety Data Sheet (MSDS).
    d. Describe basic electrical safety practices including removal of jewelry and metal objects from body, probing techniques, using insulated gloves and boots, and grounding, and personal safety devices.
    e. Describe hazards of electrical shock including effects of current, shock avoidance techniques, and shock treatment procedures.
    f. Describe accident procedures including getting help, basic first aid, cardiopulmonary resuscitation (CPR), and accident report form.

g. Describe basic electric circuit safety methods including proper grounding, importance of third wire, and ground fault interrupters.
h. Describe the operation of current overload devices including fuses and circuit breakers.

Related Academic Topics (See Appendix A): C1, C4, C5, S5, S6, S8
Workplace Skills (See Appendix B): WP5, WP6

18. Develop advanced leadership and organizational skills.
    a. Identify VICA leadership and skills competition activities including leadership skills development programs, skills competitions, and organizational skills.
    b. Identify similarities between VICA leadership skills and workplace leadership skills including organizational structure, promotional opportunities, and benefits.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP1, WP3, WP6

19. Identify common tools, equipment, materials, and hardware used in electrical trades.
    a. Identify common and electrical specialty tools used in electrical trades and demonstrate the use of each tool including measuring and leveling tools, fastening tools, cutting and crimping tools, boring tools, heating tools, bending tools, volt ohmmeter (VOM), megohmmeter, and metering and test equipment.
    b. Identify classes and types of outlet boxes, devices, covers, and plates used in electrical wiring including applications of each.
    c. Identify common types of hardware used in electrical wiring including fasteners, supports, and anchors.
    d. Identify common types of conduits and their applications.

Related Academic Topics (See Appendix A): C1, C3, C4
Workplace Skills (See Appendix B): WP1, WP4, WP5

20. Identify conduit and wire cable working tools.
    a. Identify the types of conduit benders including hand, mechanical, and hydraulic types.
    b. Identify wire and cable pulling equipment including fish tapes.
    c. Identify conduit cutting and threading tools including saws, pipe cutters, pipe reamers, and pipe threaders.
    d. Identify knockout cutters including hand, mechanical, and hydraulic types.

Related Academic Topics (See Appendix A): C1, C3, C4
Workplace Skills (See Appendix B): WP1, WP4, WP5

21. Bend, cut, ream, and thread conduit and install connectors on PVC.
    a. Bend, cut, ream, and thread rigid metal conduit according to industry standards.
    b. Bend EMT including stub-ups, back to back, offset, saddle, and four point saddle.

c. Cut, ream, offset, and install connectors on PVC according to industry standards.

Related Academic Topics (See Appendix A): C1, C3, C4
Workplace Skills (See Appendix B): WP1, WP4, WP5

22. Determine the type and size of conductors/cables used in the electrical trades.
    a. Describe factors that determine the type and size of conductors including type of conducting materials, load, length of wire, ambient temperature, moisture, voltage drop, and cross-sectional area.
    b. Identify types of cables used in the electrical trades according to National Electrical Code (NEC) and local codes.

    Related Academic Topics (See Appendix A): C3, C4, C5, S6
    Workplace Skills (See Appendix B): WP4, WP5, WP6
23. Determine wiring connections utilizing switching circuits to NEC and local codes.
    a. Perform sound wiring connections, including connectors, terminals, and lugs.
    b. Describe functions of switches, including visualization and building of circuits in single pole, double pole, three-way, and four-way switches.
    c. Wire electrical switching circuits including single pole, double pole, three-way, and four-way.

    Related Academic Topics (See Appendix A): C3, C4, C5, S6
    Workplace Skills (See Appendix B): WP4, WP5, WP6
24. Determine the grounding requirements according to NEC and local codes.
    a. Perform sound grounding connections as per NEC and/or local codes.
    b. Test grounding system both mechanically and electrically using proper test equipment.

    Related Academic Topics (See Appendix A): C3, C4, C5, S6
    Workplace Skills (See Appendix B): WP4, WP5, WP6
25. Identify symbols and information commonly used on blueprints used in residential electrical trades.
    a. Interpret symbols used in residential wiring commonly found in blueprint specifications.

    Related Academic Topics (See Appendix A): C1, C3, C5, M7
    Workplace Skills (See Appendix B): WP1, WP4, WP5
26. Calculate circuit loads and voltage drops according to the wiring schematic to include carriers, load, and devices.
    a. Interpret a wiring schematic to calculate circuit loads and voltage drops in dwellings.

    Related Academic Topics (See Appendix A): C2, C4, M7
    Workplace Skills (See Appendix B): WP1, WP4, WP5
27. State minimum requirements for residential outlets according to NEC.
    a. Determine minimum requirements for residential outlets.

    Related Academic Topics (See Appendix A): C1, C2, C4, M7
    Workplace Skills (See Appendix B): WP1, WP4, WP5

28. Determine the types of overcurrent protection devices, including fuses, circuit breakers, and ground fault circuit interrupts (GFCI) used in safety switches or load centers.
    a. Describe the types of overcurrent protective devices including circuit breakers and fuses of less than 600 volts.
    b. Identify installations that require GFCI protection according to NEC.
    c. Identify types of safety switches and load centers including nomenclature according to NEC.
    d. Wire a receptacle circuit to the load center according to NEC.

    Related Academic Topics (See Appendix A): C1, C2, C4, M1
    Workplace Skills (See Appendix B): WP1, WP4, WP5
29. Determine locations of electrical outlets as shown on the electrical blueprint, according to the NEC.
    a. Identify locations where at least one receptacle is required according to NEC.
    b. Describe planning techniques when placing boxes on plans according to NEC.
    c. Explain acceptable heights for boxes in various locations according to shop standards.
    d. Describe the steps in installing boxes in exterior walls to be brick veneered according to NEC.
    e. Describe the required outlets for various living areas in a residence according to NEC.

    Related Academic Topics (See Appendix A): C1, C2, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP1, WP4, WP5
30. Wire electrical devices/loads in accordance with NEC and electrical floor plan.
    a. Install a device box when given cabinet height and wall covering according to NEC.
    b. Install a ceiling box when given ceiling covering thickness according to NEC.
    c. Wire a 120-volt device or receptacle according to NEC.
    d. Wire a 240-volt device or receptacle according to NEC.

    Related Academic Topics (See Appendix A): C1, C2, C4, C5, M4, M7, S6
    Workplace Skills (See Appendix B): WP1, WP4, WP5
31. Determine service entrance requirements.
    a. Identify parts of a service entrance according to NEC.
    b. State clearances for service drops in varying situations according to NEC.
    c. Identify the different types of grounding electrodes according to NEC.
    d. Describe service requirements for manufactured homes according to NEC.
    e. Install an overhead raceway with service entrance conductors through meter base to load center or panel with minimum of 100 amperes according to NEC.

    Related Academic Topics (See Appendix A): C1, C2, C3, C5, M1, S6
    Workplace Skills (See Appendix B): WP1, WP2, WP5

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32. Determine the requirements for electrical trim-out and troubleshoot a residence according to NEC.
    a. Explain the grounding requirement for appliances according to NEC.
    b. Describe steps for panel trim-out including setting the panel, covers, wire termination, load balancing, labeling, and installation of wiring according to industry standard.
    c. Explain troubleshooting procedures including knowing the system, identifying the problem, listing possible causes, repairing the circuit or correcting the problem, inspecting and testing the system, and activating (if possible).
    d. Troubleshoot an electrical circuit including knowing the system, identifying the problem, listing possible causes, repairing the circuit or correcting the problem, inspecting and testing the system, and activating (if possible).

    Related Academic Topics (See Appendix A): C1, C2, C3, C5, M1, S6
    Workplace Skills (See Appendix B): WP1, WP2, WP5
33. Demonstrate safe procedures associated with electrical motors in new and existing systems.
    a. Perform tag and lock procedures.
    b. Select and install proper overload and overcurrent devices according to NEC.

    Related Academic Topics (See Appendix A): C1, C2, C3, C4
    Workplace Skills (See Appendix B): WP4, WP5
34. Differentiate between types/classes of electrical motors.
    a. Explain direct current motor theory of operation including series, shunt, and compound.
    b. Explain single-phase motor theory of operation including squirrel cage, capacitor start, capacitor run, shaded pole, and repulsion start-induction run.
    c. Explain three-phase motor operation including squirrel cage, synchronous, and wound rotor along with their voltages, amperages, and nameplate data.

    Related Academic Topics (See Appendix A): C1, C2, C3, S6
    Workplace Skills (See Appendix B): WP4, WP5
35. Determine speed, direction, and control of AC single- and three-phase and DC motors.
    a. Reverse rotation of an AC motor, including single-phase and three-phase.
    b. Wire multi-voltage single- and three-phase electrical motors.
    c. Wire multi-speed single- and three-phase electrical motors.

    Related Academic Topics (See Appendix A): C1, C2, C3, S6
    Workplace Skills (See Appendix B): WP4, WP5
36. Identify the physical and electrical characteristics of electrical motors.
    a. Determine physical and electrical characteristics of electrical motors.

b. Determine electrical characteristics using nameplate data and/or NEC requirements.

Related Academic Topics (See Appendix A): C1, C2, C3, S6
Workplace Skills (See Appendix B): WP4, WP5

37. Identify the physical and electrical characteristics of electrical starters.
    a. Determine physical characteristics including frame size, shaft, environment, and couplings.
    b. Determine electrical characteristics using nameplate data and/or NEC requirements.

    Related Academic Topics (See Appendix A): C1, C2, C3, S6
    Workplace Skills (See Appendix B): WP4, WP5
38. Wire single/three-phase electrical motors using manual and automatic controllers/starters with forward/reverse modes.
    a. Wire single-phase manual/automatic controller for speed control and/or direction.
    b. Wire three-phase manual/automatic controller for speed control and/or direction.

    Related Academic Topics (See Appendix A): C1, C2, C3, S6
    Workplace Skills (See Appendix B): WP4, WP5
39. Describe function and application of programmable logic controls.
    a. Define terms associated with programmable logic controls including digital, analog signal, counter, discrete, fiber optics, input, logic, networking, output, programmer, and programmable logic controller.
    b. Explain programmable logic controller functions including input and output signal compared to previously programmed instructions.
    c. Identify input devices for programmable logic controllers including pushbutton switches, limit switches, proximity switches, timers, photoelectric cells, and flow switches.
    d. Identify output devices for programmable logic controllers including motor starters, contractors, solenoids, pilot lights, and coil relays.
    e. Write a basic PLC program including two and three wire controls.
    f. Wire a PLC input device including pushbutton switches, limit switches, proximity switches, timers, photoelectric cells, and flow switches.
    g. Wire a PLC output device including timers, pilot lights, brakes, solenoids, starter motors, contractors, and coil relays.

    Related Academic Topics (See Appendix A): C1, C2, C3, S6, M1
    Workplace Skills (See Appendix B): WP4, WP5
40. Develop employability skills.
    a. Prepare a resume containing essential information including personal information, education, and employment experience using correct grammar, spelling, and punctuation.
    b. Complete job application forms including correct grammar, spelling, and punctuation.
    c. Explain procedures for job interviews using correct job etiquette.

d. Demonstrate the role of an applicant in a job interview using correct interview procedures.

Related Academic Topics (See Appendix A): C1, C3, C4, C6
Workplace Skills (See Appendix B): WP2, WP3, WP6

BASELINE COMPETENCIES FOR ELECTRONICS PROGRAMS

The following competencies and suggested objectives are taken from the publication *Mississippi Curriculum Framework for Electronics*. These competencies and objectives represent the baseline which was used to develop the community/junior college Electronics-based courses. Students enrolled in postsecondary courses should either (1) have documented mastery of these competencies, or (2) be provided with these competencies before studying the advanced competencies in the Electronics-based programs.

Baseline competencies may be integrated into existing courses in the curriculum or taught as special "Introduction" courses. The "Introduction" courses may be taught for up to six semester hours of institutional credit and may be divided into two courses. If the Baseline Competencies are to be taught as "Introduction" courses, each course should be at least 3 credit hours. The following course number(s) and description should be used:

Course Name(s): Introduction to Electronics Technology, Introduction to Electronics Technology I, or Introduction to Electronics Technology II

Course Abbreviation(s): ELT 100(3-6), ELT 1013, ELT 1023

Classification: Vocational-Technical Core

Description: These courses contain the baseline competencies and suggested objectives from the high school Electronics curriculum which directly related to the community college Electronics-based programs. The courses are designed for students entering the community college who have had no previous training or documented experience in the field. (3-6 semester hours based upon existing skills for each student. May be divided into 2 courses for a maximum total of 6 hours of institutional credit.)

Competencies and Suggested Objectives:

1. Describe local program and vocational center policies and procedures.
   a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

2. Describe employment opportunities and responsibilities for electronics technicians and related employees.
   a. Describe employment opportunities available for electricians, electronics technicians, and electrical related employees including potential earnings, employee benefits, job availability, possible places of employment, working conditions, and educational requirements.
   b. Describe basic employee responsibilities including punctuality, physical requirements, customer relations, following directions, job safety, and entry level skills.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
3. Describe personal and general safety rules for working in a shop/lab and industry.
   a. Describe personal safety rules for working in a shop/lab and industry including work clothing, protective clothing, safety glasses, and hearing, feet, hand, and head protection.
   b. Describe general workplace safety rules including shop/lab (work site) organization.
   c. Describe the proper use of fire extinguishers and classes of fires including class A (trash and wood), B (petroleum products), C (energized electrical), and D (combustible metals).
   d. Identify standard industry Safety Color Codes.
   e. Describe procedures for safely handling heavy objects including using lifting devices, having straight back, lifting with legs, getting help for heavy objects, holding objects close to the body, sizing up load, and holding feet close together.
   f. Describe safety practices for using climbing devices including ladders, scaffolding, and climbing belts.
   g. Describe the Occupational Safety and Health Act (OSHA) and its effect on the workplace.

   Related Academic Topics (See Appendix A): C2, C4
   Workplace Skills (See Appendix B): WP5
4. Describe basic electrical safety practices.
   a. Describe factors to consider in storing and/or disposing of hazardous materials including PCB's in old transformers and capacitors, volatile liquids, battery acid, explosive gases, refrigerants, and POL products.
   b. Identify hazardous materials that may be found on a job site and describe procedures for handling/avoidance or removal of materials including asbestos, PCB's, POL products, refrigerants, flammable materials, and smoke.
   c. Interpret a Materials Safety Data Sheet (MSDS).
   d. Describe basic electrical safety practices including removal of jewelry and metal objects from body, probing techniques, using insulated gloves and boots, grounding, and personal safety devices.

e. Describe hazards of electrical shock including effects of current, shock avoidance techniques, and shock treatment procedures.
f. Describe accident procedures including getting help, basic first aid, cardiopulmonary resuscitation (CPR), and accident report form.
g. Describe basic electric circuit safety methods including proper grounding, importance of third wire, and ground fault interrupters.
h. Describe the operation of current overload devices including fuses and circuit breakers.

Related Academic Topics (See Appendix A): C1, C4, C5, S5, S6, S8
Workplace Skills (See Appendix B): WP5, WP6

5. State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided students in electronics by the Vocational Industrial Clubs of America (VICA).
   a. State procedures of leadership used in organizational meetings to reach an agreement in an orderly manner including procedures for gaining recognition in a meeting and conducting a VICA Club meeting.
   b. Describe the purposes of VICA including leadership development, personal development, and skills competition.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3, WP6
6. Identify desirable personal behavior and characteristics for use in the electronic occupations.
   a. Identify desirable personality traits to apply when serving the public including politeness, cheerfulness, enthusiasm, efficiency, competency, friendliness, self-confidence, honesty, and integrity.
   b. Identify desirable personality traits to apply when communicating with employees, supervisors, and other employees including effective communication skills, positive attitude, honesty, integrity, loyalty, team commitment, cooperation, and ability to follow oral and written instructions.
   c. Identify desirable characteristics of the personal work ethic to apply in electronics including attendance, promptness, desire to achieve, loyalty, competent performance as required by employer, effective customer relations, cooperation, and obedience to rules and regulations.

   Related Academic Topics (See Appendix A): C4, C5, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
7. Identify legal requirement for participation in electronics occupations.
   a. Describe ways to avoid legal liability problems in electronics including using equipment approved by national testing organization; installing wiring to NEC, local codes, and customer specifications; and maintaining license and bonding.

   Related Academic Topics (See Appendix A): C3, C4, C6
   Workplace Skills (See Appendix B): WP4, WP6

8. Describe the terms and scientific principles associated with direct current electricity.
   a. Define terms associated with the nature of matter including physical characteristics of matter (elements, compounds, atoms, electrons, protons, and neutrons).
   b. Describe laws of electrical charges including like and unlike charges.
   c. Identify electrical materials including conductors, insulators, and semiconductors.
   d. Describe methods of generating electricity including solar, chemical, mechanical, and thermal.
   e. Describe the principles and operation of batteries.
   f. Describe basic theories of current flow including electron and conventional flow methods.
   g. Describe DC circuit parameters including voltage, power, current, and resistance.
   h. Identify resistor types and values using standard resistor color codes and alphanumeric codes.
   i. Perform basic engineering notation calculations including conversion, adding, subtracting, multiplying, and dividing.
   j. Identify DC circuit schematic symbols.

   Related Academic Topics (See Appendix A): C1, C5, C6, M1, M4, S6, S8
   Workplace Skills (See Appendix B): WP1, WP2, WP4, WP6
9. Create circuits and measure DC electricity using the multimeter.
   a. Describe and demonstrate use of a multimeter including measuring voltage, current, and resistance.
   b. Demonstrate use of Ohm's Law to calculate circuit parameters for a series circuit including voltage, current, resistance, and power.
   c. Draw and construct a series circuit with a minimum of three resistances.
   d. Calculate and measure circuit parameters for a series circuit.
   e. Demonstrate use of Ohm's Law to calculate circuit parameters for a parallel circuit including voltage, current, resistance, and power.
   f. Draw and construct a parallel circuit with a minimum of three resistances.
   g. Calculate and measure circuit parameters for a parallel circuit.
   h. Demonstrate use of Ohm's Law to calculate circuit parameters for a series-parallel circuit including voltage, current, resistance, and power.
   i. Draw and construct a series-parallel circuit with a minimum of three resistances.
   j. Calculate and measure circuit parameters for a series-parallel circuit.

   Related Academic Topics (See Appendix A): C1, C4, C6, M1, M4, S6, S8
   Workplace Skills (See Appendix B): WP4, WP5, WP6
10. Describe the principles of magnetism and electromagnetic properties.
   a. Describe the principles of magnetism including magnetic fields, polarities, core materials, permeability, motor action, induced current, and associated laws.

b. Describe the principles of electromagnetic properties including magnetic fields, polarities, core materials, permeability, motor action, induced current, and associated laws.
c. Construct a simple electromagnet, including use of copper windings and a metal rod.

Related Academic Topics (See Appendix A): C1, C2, C4, C5, M1, M4, S6, S8
Workplace Skills (See Appendix B): WP4, WP5, WP6

11. Describe the terms and scientific principles associated with alternating current electricity.
    a. Describe principles of AC generation including sine wave characteristics and magnetic induction.
    b. Define terms associated with AC voltage including AC frequency, period, and time.
    c. Describe sources of AC voltage including power plants (hydroelectric, fossil fuel, solar, wind, and nuclear power) and generators.
    d. Describe distribution route and components used from power plant to home or business including transmission lines, transformers, substations, and service entrances.
    e. Describe the properties and characteristics of inductors including inductance, physical properties, DC and AC characteristics, units, current, and frequency.
    f. Describe the properties and characteristics of transformers including rating, types, uses, turns ratio, and connections.
    g. Describe properties and characteristics of capacitors including capacitance, physical properties, DC and AC characteristics, units, and reactance.
    h. Describe differences in phases in electrical power supply, including single-phase, and polyphase.

    Related Academic Topics (See Appendix A): C1, C2, C4, C5, M1, M2, S5, S8
    Workplace Skills (See Appendix B): WP2, WP5, WP6

12. Display and measure AC waveforms using the oscilloscope and function generator.
    a. Demonstrate the use of an oscilloscope including safety and measurement of DC and AC voltages and time.
    b. Demonstrate the use of a function generator including safety, square wave, sine wave, sawtooth wave, frequency, and amplitude.

    Related Academic Topics (See Appendix A): C2, C4, C5, M2, M4, S5, S8
    Workplace Skills (See Appendix B): WP1, WP4, WP5

13. Describe and construct series and parallel circuits.
    a. Draw and construct a series resistive circuit, calculating parameters and discussing phase relationship.
    b. Draw and construct a parallel resistive circuit, calculating parameters and discussing phase relationship.

c. Draw and construct a series inductive circuit including calculating parameters and time and voltage measurement in a circuit with two inductors.
d. Draw and construct a parallel inductive circuit including calculating parameters and time and voltage measurement in a circuit with two inductors.
e. Draw and construct a series RL circuit including calculating parameters and time and voltage measurement.
f. Draw and construct a parallel RL circuit including calculating parameters and time and voltage measurement.
g. Draw and construct a series capacitive circuit including calculating parameters and time and voltage measurement of a circuit with two capacitors.
h. Draw and construct a parallel capacitive circuit including calculating parameters and time and voltage measurement of a circuit with two capacitors.
i. Draw and construct a series RC circuit including calculating parameters and time and voltage measurement.
j. Draw and construct a parallel RC circuit including calculating parameters and time and voltage measurement.
k. Draw RL and RC time constants including calculating parameters and time and voltage measurement.
l. Draw and construct a series RCL circuit including calculating parameters and time and voltage measurement.
m. Draw and construct a parallel RCL circuit including calculating parameters and time and voltage measurement.
n. Describe series and parallel resonance.

Related Academic Topics (See Appendix A): C2, C4, C5, M2, M4, S5, S8
Workplace Skills (See Appendix B): WP1, WP4, WP5

14. Describe local program and vocational center policies and procedures.
    a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations.

    Related Academic Topics (See Appendix A): C1, C4, C6
    Workplace Skills (See Appendix B): WP2, WP3, WP6
15. Describe employment opportunities and responsibilities for electronics technicians and related employees.
    a. Describe employment opportunities available for electricians, electronics technicians, and electrical related employees including potential earnings, employee benefits, job availability, possible places of employment, working conditions, and educational requirements.

b. Describe basic employee responsibilities including punctuality, physical requirements, customer relations, following directions, job safety, and entry level skills.

Related Academic Topics (See Appendix A): C1, C4, C6
Workplace Skills (See Appendix B): WP2, WP3, WP6

16. Describe personal and general safety rules for working in a shop/lab and industry.
    a. Describe personal safety rules for working in a shop/lab and industry including work clothing, protective clothing, safety glasses, and hearing, feet, hand, and head protection.
    b. Describe general workplace safety rules including shop/lab (work site) organization.
    c. Describe the proper use of fire extinguishers and classes of fires including class A (trash and wood), B (petroleum products), C (energized electrical), and D (combustible metals).
    d. Identify standard industry Safety Color Code.
    e. Describe procedures for safely handling heavy objects including using lifting devices, having straight back, lifting with legs, getting help for heavy objects, holding objects close to the body, sizing up load, and holding feet close together.
    f. Describe safety practices for using climbing devices including ladders, scaffolding, and climbing belts.
    g. Describe the Occupational Safety and Health Act (OSHA) and its effect on the workplace.
    h. Identify the publisher, purpose, and application of the NEC.

    Related Academic Topics (See Appendix A): C2, C4
    Workplace Skills (See Appendix B): WP5

17. Describe basic electrical safety practices.
    a. Describe factors to consider in storing and/or disposing of hazardous materials including PCB's in old transformers and capacitors, volatile liquids, battery acid, explosive gases, refrigerants, and POL products.
    b. Identify hazardous materials that may be found on a job site and describe procedures for handling/avoidance or removal of materials including asbestos, PCB's, POL products, refrigerants, flammable materials, and smoke.
    c. Interpret a Materials Safety Data Sheet (MSDS).
    d. Describe basic electrical safety practices including removal of jewelry and metal objects from body, probing techniques, using insulated gloves and boots, grounding, and personal safety devices.
    e. Describe hazards of electrical shock including effects of current shock avoidance techniques, and shock treatment procedures.
    f. Describe accident procedures including getting help, basic first aid, cardiopulmonary resuscitation (CPR), and accident report form.

g. Describe basic electric circuit safety methods including proper grounding, importance of third wire, and ground fault interrupters.
h. Describe the operation of current overload devices including fuses and circuit breakers.

Related Academic Topics (See Appendix A): C1, C4, C5, S5, S6, S8
Workplace Skills (See Appendix B): WP5, WP6

18. Develop advanced leadership and organizational skills.
    a. Identify VICA leadership and skills competition activities including leadership skills development programs, skills competitions, and organizational skills.
    b. Identify similarities between VICA leadership skills and workplace leadership skills including organizational structure, promotional opportunities, and benefits.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP1, WP3, WP6

19. Define and describe solid state electronic characteristics.
    a. Define the characteristics of semiconductor materials including atomic theory review and semiconductor physics.
    b. Describe characteristics of a P.N. junction diode including P-type materials, N-type materials, and biasing.

Related Academic Topics (See Appendix A): C1, C2, C4, S6
Workplace Skills (See Appendix B): WP1, WP2, WP4

20. Describe and construct solid state circuits and components.
    a. Describe and construct diode rectifier circuits including drawing, calculating parameters, and measurements of both full wave and half wave circuits.
    b. Identify and construct common filter networks including Pi, T, and L circuits.
    c. Identify special purpose diodes including LED's, Zener, and other diode applications.
    d. Describe characteristics transistors including bi-polar, FETS, and MOSFETS.
    e. Describe and construct basic transistor circuit configurations including drawing and measurement.
    f. Describe, draw, and construct a single stage transistor amplifier.
    g. Describe the use of integrated circuits in solid state electronics to include their relative importance, advantages and disadvantages, and major components.

Related Academic Topics (See Appendix A): C1, C2, C4, C5, S6, S8
Workplace Skills (See Appendix B): WP1, WP4, WP5, WP6

21. Utilize soldering as a connective device.
    a. Match soldering tools and materials with their uses including materials and proper techniques.

b. Solder and desolder various components and connectors including soldering and desoldering components.
c. Protect temperature sensitive components, and static sensitive devices (ESD), using protective devices.

Related Academic Topics (See Appendix A): C1, C2, C4, C5, S6, S8
Workplace Skills (See Appendix B): WP1, WP4, WP5, WP6

22. Convert between number systems and perform mathematical operations in number systems.
    a. Convert between number systems including decimal, binary, octal, and hexadecimal.
    b. Perform mathematical operations in number systems including decimal, binary, octal, and hexadecimal.

    Related Academic Topics (See Appendix A): C1, C2, C4, C5, M1, M2
    Workplace Skills (See Appendix B): WP1, WP4, WP5
23. Describe digital components and construct digital circuits.
    a. Describe basic logic gates including drawing schematic symbols, constructing truth tables, breadboarding gates, and verifying truth tables.
    b. Describe and construct combinational logic circuits including writing Boolean expression, drawing circuit, and verification.
    c. Describe logic gate families including TTL and CMOS operating characteristics.
    d. Describe and construct basic flip-flop circuits including drawing, breadboarding, completing truth table, and applications.

    Related Academic Topics (See Appendix A): C1, C2, C3, C5, M1, S5
    Workplace Skills (See Appendix B): WP2, WP4, WP5, WP6
24. Develop employability skills.
    a. Prepare a resume containing essential information including personal information, education, and employment experience using correct grammar, spelling, and punctuation.
    b. Complete job application forms including correct grammar, spelling, and punctuation.
    c. Explain procedures for job interviews using correct job etiquette.
    d. Demonstrate the role of an applicant in a job interview using correct interview procedures.

    Related Academic Topics (See Appendix A): C1, C4, C6
    Workplace Skills (See Appendix B): WP2, WP3, WP6

SECTION II:

CURRICULUM GUIDE

FOR

ELECTRICITY/ELECTRONICS/RELATED ENGINEERING CLUSTER

AUTOMATED MANUFACTURING TECHNOLOGY COURSES

Course Name: Systems Programming I

Course Abbreviation: MFT 1123

Classification: Vocational-Technical Core (Automated Manufacturing Technology); Vocational-Technical Elective (Electronics Technology)

Description: This course is designed to teach the student advanced programming techniques. Students develop professional programming skills and implement software into automated manufacturing systems. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Demonstrate the capability to install software.
   a. Install application software.
   b. Configure application software.
   c. Configure operational environment.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
2. Develop and use programming fundamentals.
   a. Use appropriate syntax for a program.
   b. Use command structure to write a program.
   c. Test and debug a program.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
3. Develop program techniques.
   a. Demonstrate flow charting skills.
   b. Demonstrate skills for writing input codes.
   c. Demonstrate skills for writing process codes.
   d. Demonstrate skills for writing output codes.
   e. Demonstrate program testing and debugging skills.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Principles of Automation I

Course Abbreviation: MFT 1214

Classification: Vocational-Technical Core (Automated Manufacturing Technology); Vocational-Technical Elective (Instrumentation Technology)

Description: This is the first of two courses which examine the mechanical, electrical, electronic, and fluid power components utilized in flexible automated manufacturing systems. In this course students are introduced to electric motors, mechanical drives and digital logic circuits. Theory is reinforced with lab work using various components of the automated manufacturing laboratory. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Demonstrate safety procedures.
   a. Apply safety rules for personal and general shop safety including eye, ear, and body protection; general rules of shop conduct and the use of safety color coding.
   b. Apply general safety rules for tool and shop equipment use including use of hand tools, air and electric power tools, and other shop equipment.
   c. Apply general safety rules associated with working on various systems.
   d. Apply rules and procedures associated with fire safety including procedures for handling and storing flammable liquids and proper use of fire fighting devices.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
2. Describe and explain the characteristics and applications of solid state devices used in control systems.
   a. Explain the characteristics of a diode.
   b. Troubleshoot a diode current.
   c. Explain the characteristics of bipolar transistor.
   d. Troubleshoot a transistor current.
   e. Explain characteristics of silicon controlled rectifier.
   f. Troubleshoot a silicon controlled rectifier.
   g. Explain characteristics of a triac.
   h. Troubleshoot a triac circuit.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP5

3. Demonstrate the ability to troubleshoot a power supply.
   a. Explain the characteristics of the operation of DC power supply.
   b. Troubleshoot and repair a DC power supply.
   c. Explain the characteristics of the operation of AC power supply.
   d. Troubleshoot and repair an AC power supply.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
4. Explain the application of the operation of operational amplifiers.
   a. Discuss the fundamentals of operational amplifiers.
   b. Explain the operation and performance characteristics of various types of operational amplifier circuits.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
5. Explain the theory of operation of AC/DC motors, tachometers, optical encoders, servos, resolvers, and stepped motors.
   a. Describe the detailed operation of AC/DC motors.
   b. Describe the detailed operation of tachometers.
   c. Describe the detailed operation of optical scanners.
   d. Describe the detailed operation of servos.
   e. Describe the detailed operation of resolvers.
   f. Describe the detailed operation of stepped motors.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
6. Explain the principles of the operation of mechanical drives.
   a. Identify the major types of mechanical drives.
   b. Identify potential problems with mechanical drives.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Apply the fundamental principles of digital principles.
   a. Identify and explain the operational logic.
   b. Develop truth tables for combinational logic circuits.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Computer Upgrade and Repair

Course Abbreviation: MFT 1613

Classification: Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This course is designed to develop skills required to upgrade, repair, maintain, and troubleshoot IBM compatible computers used in manufacturing operations. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisite: None

Competencies and Suggested Objectives:

1. Explain system features of IBM compatible computers.
   a. Explain the various types of system architecture used in the IBM compatible systems.
   b. Explain memory structure and its use.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
2. Identify components of different types of IBM compatible PCs.
   a. Identify major components of XT motherboard.
   b. Identify major components of AT motherboard.
   c. Identify major components of micro-channel motherboard.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
3. Apply the principles of compatibility of IBM systems.
   a. Explain operating system level of compatibility.
   b. Explain ROM BIOS level of compatibility.
   c. Explain hardware level of compatibility.
   d. Explain physical level of compatibility.
   e. Discuss selection criteria for upgrading.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
4. Perform system tear down and inspection.
   a. List and identify tools appropriate for system tear down and assembly.
   b. List and identify appropriate test equipment for system tear down and inspection.
   c. Perform system tear down and assembly using proper procedures.
   d. Install and format a hard drive.
   e. Install a floppy drive.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

5. Perform systems diagnosis on a faulty computer system.
   a. Use appropriate software to diagnosis faulty operation.
   b. Make repairs to place computer in operation.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Automated Motion Control

Course Abbreviation: MFT 2013

Classification: Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This course is designed to develop advanced skills in the set up of servo motion controller systems, troubleshooting and maintenance of servo motion control systems, and programming of servo motion control. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Identify a Servo Motion Control (SMC) Systems Application in Production Mode.
   a. Run a SMC applications program.
   b. Identify SMC operating parameters.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
2. Gather information for systems diagnosis.
   a. Gather information from the operator interface.
   b. Access and cross reference error messages.
   c. Access on-line status.
   d. Run and trace an applications program.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
3. Diagnose and correct a faulted application.
   a. Diagnose and reset an E-Stop condition.
   b. Up and down load program application files.
   c. Establish a desired home position post-drive train repair.
   d. Diagnose and correct an excess following/position error condition.
   e. Diagnose and correct an excess velocity error condition.
   f. Diagnose and correct an axis feedback failure condition.
   g. Diagnose, monitor, and troubleshoot discreet machine input/output devices.
   h. Diagnose, correct, and establish PLC/SMC communications.
   i. Diagnose and interpret a SMC applications program.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Materials Requirement Planning (MRP)

Course Abbreviation: MFT 2113

Classification: Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This is a course that will develop student skills and mechanics in MRP II. Areas include resource management for productive manufacturing, development, and executing an MRP II plan, order point inventory, and closed loop systems. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Explain the methods of managing resources of a manufacturing company more productively.
   a. Identify the role of CEO in MRP.
   b. Identify the role of Marketing in MRP.
   c. Identify the role of Manufacturing in MRP.
   d. Identify the role of Purchasing in MRP.
   e. Identify the role of Finance in MRP.
   f. Identify the role of Engineering in MRP.
   g. Lay out an MRP II data processing system.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
2. Execute an MRP plan.
   a. Develop and implement an MRP plan within a manufacturing setting.
   b. Diagnose, monitor, and define problems within an implemented MRP plan.
   c. Establish an Order Point Inventory Model.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
3. Collect information regarding a Closed Loop MRP.
   a. Define closed loop system.
   b. Explain materials requirements planning.
   c. Develop capacity planning and scheduling.
   d. Design and produce MRP output reports.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2

Course Name: Principles of Automation II

Course Abbreviation: MFT 2224

Classification: Vocational-Technical Core (Automated Manufacturing Technology)

Description: This course will involve the student with hands-on experience in developing applications programs, performing diagnostics, and systems interfacing of process robots, CNC machining, and programmable logic controllers using the technology developed in preceding courses. The subject matter is treated on an individual machine basis in preparation for studies in system integration and computer control. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Perform diagnosis of malfunctions in automated machinery.
   1. Diagnose and troubleshoot electro-mechanical subsystems.
   2. Diagnose and troubleshoot fluid power subsystems.
   3. Diagnose and troubleshoot electronics subsystems.
   4. Diagnose and troubleshoot computer subsystems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
2. Write application programs for automated subsystems including CNC, robotics, Vision, etc.
   1. Write a program that will test/operate automated subsystems.
   2. Select operating parameters and programming formats for automated subsystems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Develop PLC interfacing applications for use in flexible automated systems.
   1. Demonstrate fundamental programming skills required for the PLC.
   2. Write a PLC program to control relevant subsystems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Statistical Process Control

Course Abbreviation: MFT 2313

Classification Vocational-Technical Elective (Automated Manufacturing Technology, Telecommunications Technology)

Description: This course provides a detailed study of the methods of implementing and using a computer-based statistical process control system and the associated gauging and automated data collection devices. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Describe and discuss the underling philosophy of SPC.
   a. Explain process variability.
   b. Describe the two types of variability present in all processes.
   c. Demonstrate skill to recognize terminology used in SPC.
   d. Demonstrate skill in the use of SPC statistics.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2
2. Apply SPC concepts.
   a. Configure gauging and measurements for use in automated systems.
   b. Develop control charts for manual and computer-based variable and attribute data.
   c. Interpret histograms, control charts, and other graphical data as they relate to stability in the automated manufacturing process.
   d. Develop process capability studies and interpret the resulting indices.
   e. Develop readability and repeatability (R & R) studies and interpret the results.
   f. Program and use automated data collection equipment for multi-gauge inputs with computer interfacing.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Computer Integrated Manufacturing

Course Abbreviation: MFT 2413

Classification: Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This course is a study of how computers, robots, CAD/CAM, vision systems, and other automated systems can be used in computer integrated manufacturing (CIM). (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Develop the ability to discuss the evolution and principles of CIM.
   a. Discuss the history and development of CIM.
   b. Discuss the principles and applications of CIM.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
2. Develop a CIM application.
   a. Plan a CIM project.
   b. Implement a CIM project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6

Course Name: Data Acquisition and Communications

Course Abbreviation: MFT 2513

Classification: Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This is a course in acquisition and communication of systems data in automated applications. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Explain data communication components used in automatic systems.
   a. Identify characteristics and uses of various EIA standard data communication interfaces.
   b. Describe standard serial communications used in computers.
   c. Describe parallel communication interfaces.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
2. Use data communication software and test the equipment.
   a. Configure computer for serial or parallel communications.
   b. Perform data transfers between computers.
   c. Use communication test equipment to troubleshoot communications links.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Use computers and/or controllers for data acquisition.
   a. Interface sensors with computer or controller for data acquisition.
   b. Write software for data acquisition application.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Flexible Manufacturing Systems

Course Abbreviation: MFT 2614

Classification: Vocational-Technical Core (Automated Manufacturing Technology)

Description: This course is a production project which requires the student to apply technical skills acquired in previous courses. Project management is provided by the instructor with the students working as teams in each particular area of the manufacturing system. The students are required to plan the project and prepare the integrated system to manufacture a product. This includes all software, hardware, fixtures, clamping mechanisms, material handling requirements, sensors and interfacing, and external control devices. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Industrial Robotics (ROT 1313) and Principles of Automation II (MFT 2224) or consent of instructor

Competencies and Suggested Objectives:

1. Plan a project that will utilize the automated system.
   a. Develop documentation that outlines major steps in the program.
   b. Develop a process flow chart that identifies and sequences primary production steps.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
2. Plan and specify the automation equipment required for the project.
   a. Identify the automation equipment required to support the project.
   b. Identify and list the individual process steps with supporting addresses and control data.
   c. Identify the material requirements.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
3. Develop and program the project.
   a. Develop the initialization programming logic.
   b. Develop the input/output logic.
   c. Develop the process control logic.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
4. Test and debug the project.
   a. Configure the automation system for the project.
   b. Troubleshoot and correct the program syntax and logic problems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5

Course Name: Special Project

Course Abbreviation: MFT 291(1-3)

Classification: Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This course is designed to provide the student with practical application of skills and knowledge gained in other electronics or electronics-related technical courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Develop a written plan which details the activities and projects to be completed.
   a. Utilize a written plan which details the activities and projects to be completed.
   b. Perform written occupational objectives in the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
2. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
3. Utilize a set of written guidelines for the special project.
   a. Develop and follow a set of written guidelines for the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6

Course Name: Supervised Work Experience

Course Abbreviation: MFT 292(1-6)

Classification: Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This course is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in electrical/electronics related programs

Competencies and Suggested Objectives:

1. Apply technical skills needed to be a viable member of the work force.
   a. Prepare a description of technical skills to be developed in the supervised work experience program.
   b. Develop technical skills needed to be a viable member of the work force.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1
2. Apply skills developed in other program area courses.
   a. Perform skills developed in other program area courses in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Apply human relationship skills.
   a. Practice human relationship skills in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
4. Apply and practice positive work habits and responsibilities.
   a. Perform assignments to develop positive work habits and responsibilities.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
5. Work with instructor and employer to develop written occupational objectives to be accomplished.
   a. Perform written occupational objectives in the supervised occupational experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

6. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Utilize a set of written guidelines for the Supervised Work Experience.
   a. Develop and follow a set of written guidelines for the Supervised Work Experience.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY COURSES

Course Name: Satellite Systems

Course Abbreviation: CET 1113

Classification: Vocational-Technical Elective (Communications Electronics Repair Technology)

Description: This course is designed to provide the student with the necessary skills to service, repair, and install home satellite receiving systems. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Identify and describe the basic principles and types of satellite systems.
   a. Describe the basic principles of satellite reception.
   b. Identify the types of satellite systems and describe their differences and functions.
   c. Draw and define a block diagram of a satellite receiver.
   d. Draw and define a block diagram of a receiver and down converter.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
2. Install, align, and service satellite systems.
   a. Demonstrate the ability to determine best location, install, and align a satellite receiver for correct tracking.
   b. Troubleshoot and repair faulty components in a satellite receiver system.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5

Course Name: Diagnostics and Troubleshooting Lab

Course Abbreviation: CET 2223

Classification: Vocational-Technical Core (Communications Electronics Repair Technology)

Description: This is a laboratory course in which the students apply skills and knowledge gained in other communications electronics courses in repairing various electronic devices. Students will isolate, locate, and repair devices in a simulated industry setting. (3 sch: 6 hr. lab)

Prerequisites: Video Systems (EET 2813)

Competencies and Suggested Objectives:

1. Service and repair consumer audio electronic devices.
   a. Service/repair automotive audio equipment.
   b. Service/repair portable audio cassette systems.
   c. Service/repair compact disc equipment.
   d. Service/repair console stereo systems.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
2. Service and repair other consumer electronic devices.
   a. Service/repair microwave ovens.
   b. Service/repair small electrical devices with electronic circuits.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Video Recording Systems Lab

Course Abbreviation: CET 2323

Classification: Vocational-Technical Elective (Communications Electronics Repair Technology)

Description: This course provides instruction and practice in the maintenance and repair of consumer-type video recording and playback equipment. This course includes instruction in the maintenance and repair of video cassette recorders and players, and video camera/recorders. (3 sch: 6 hr. lab)

Prerequisites: Video Systems (EET 2813)

Competencies and Suggested Objectives:

1. Troubleshoot and repair video cassette recorders.
   a. Draw and explain a basic block diagram for a video cassette recorder (VCR).
   b. State differences in the mechanical loading of a VHS and Beta VCR.
   c. Troubleshoot and repair a power supply circuit.
   d. Troubleshoot and repair a mechanical control system.
   e. Align VCR video and audio heads.
   f. Troubleshoot and repair capstan servo control and switching circuits.
   g. Troubleshoot and repair drum servo control circuits.
   h. Troubleshoot and repair special effects generators and systems circuits.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
2. Service, troubleshoot, and repair color video camera/recorder.
   a. Draw and define a block diagram for a color video camera/recorder.
   b. Align and service/repair a video camera/recording unit.
   c. Clean the heads in a color camera recorder.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Advanced Electronic Communications

Course Abbreviation: CET 2424

Classification: Vocational-Technical Elective (Communications Electronics Repair Technology)

Description: This course is a continuation of Electronic Communication (EET 2414) with additional instruction and practice on different types of communications equipment, including FM, SSB, satellite systems, and radar. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Electronic Communications (EET 2414)

Competencies and Suggested Objectives:

1. Troubleshoot, service, and repair AM radio systems.
   a. Describe the different types of sideband transmission.
   b. Draw and define a block diagram for a single sideband (SSB) receiver.
   c. Draw and define a block diagram for a SSB transmitter.
   d. Calculate frequencies involved in the user of different sidebands.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP4
2. Troubleshoot, service, and repair FM radio systems.
   a. Construct and analyze a frequency modulation (FM) detector.
   b. Analyze the operation of phase-locked loop (PLL) circuits in modulation and detection circuits.
   c. Draw and define a block diagram of a direct FM transmitter.
   d. Draw and define a block diagram of an indirect FM transmitter.
   e. Draw and define a block diagram of an FM stereo system.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
3. Install and adjust antenna systems and transmission lines.
   a. Describe transmission line principles.
   b. Describe principles of impedance matching and perform standing wave radio (SWR) matching.
   c. Identify different types of antennas and describe their function and use.
   d. Calculate matching stub lengths for an antenna system.
   e. Explain wave guide principles.
   f. Identify different types of devices used with wave guides and describe their use.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP6

4. Explain different types of microwave transmission.
   a. Describe the principles of pulse radar transmission and reception.
   b. Draw and define a block diagram of the up-link and down-link components of a satellite transmission-reception system.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2
5. Analyze and demonstrate the characteristics and operation of digital modulation.
   a. Measure effects of noise on a pulse coded modulation system.
   b. Analyze the operation of circuitry used for delta modulation encoding and decoding.
   c. Measure the effects of noise on delta modulation.
   d. Analyze the operation of frequency shift keying (FSK), amplitude shift keying (ASK), and phase shift keying (PSK) modulation.
   e. Analyze the operation of a pulse amplitude modulation (PAM) system using a spectrum analyzer to examine spectral characteristics of PAM signals.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Video Systems Repair Lab

Course Abbreviation: CET 2823

Classification: Vocational-Technical Core (Communications Electronics Repair Technology)

Description: This course provides practice in the repair and maintenance of consumer video reception equipment. This course includes instruction in the troubleshooting and repair of all circuits in television receivers. (3 sch: 6 hr. lab)

Pre/Corequisities: Video Systems (EET 2813)

Competencies and Suggested Objectives:

1. Troubleshoot and repair television receivers.
   a. Troubleshoot and repair synchronization and video circuits in a monitor/receiver.
   b. Troubleshoot tuner systems.
   c. Troubleshoot and repair sync, deflection, and high voltage circuits in a monitor/receiver.
   d. Troubleshoot and repair audio circuits in a monitor/receiver.
   e. Troubleshoot and repair low-voltage and high-voltage power supplies in a monitor/receiver.
   f. Demonstrate the ability to localize a problem area by diagnosis of CRT screen symptoms.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
2. Adjust and/or align television receivers.
   a. Demonstrate the ability to converge and purify a color TV receiver.
   b. Demonstrate the ability to align chroma circuit in a color TV receiver.
   c. Demonstrate the ability to align radio-frequency (RF) circuits in a color TV receiver.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Special Project

Course Abbreviation: CET 291(1-3)

Classification: Vocational-Technical Elective (Communications Electronics Repair Technology)

Description: This course is designed to provide the student with practical application of skills and knowledge gained in other electronics or electronics-related technical courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Develop a written plan which details the activities and projects to be completed.
   a. Utilize a written plan which details the activities and projects to be completed.
   b. Perform written occupational objectives in the special project.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
2. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
3. Utilize a set of written guidelines for the special project.
   a. Develop and follow a set of written guidelines for the special project.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6

Course Name: Supervised Work Experience

Course Abbreviation: CET 292(1-6)

Classification: Vocational-Technical Elective (Communications Electronics Repair Technology)

Description: This is a course which is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in electrical/electronics related programs

Competencies and Suggested Objectives:

1. Apply technical skills needed to be a viable member of the work force.
   a. Prepare a description of technical skills to be developed in the supervised work experience program.
   b. Develop technical skills needed to be a viable member of the work force.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1
2. Apply skills developed in other program area courses.
   a. Perform skills developed in other program area courses in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Apply human relationship skills.
   a. Practice human relationship skills in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
4. Apply and practice positive work habits and responsibilities.
   a. Perform assignments to develop positive work habits and responsibilities.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
5. Work with instructor and employer to develop written occupational objectives to be accomplished.
   a. Perform written occupational objectives in the supervised occupational experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

6. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Utilize a set of written guidelines for the Supervised Work Experience.
   a. Develop and follow a set of written guidelines for the Supervised Work Experience.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

COMPUTER SERVICING TECHNOLOGY COURSES

Course Name: Failure Analysis

Course Abbreviation: CST 1213

Classification: Vocational-Technical Elective (Computer Servicing Technology)

Description: This course is a study of general and specific methods for analyzing failure in electronics circuits. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisites: DC Circuits (EET 1114) and AC Circuits (EET 1123)

Competencies and Suggested Objectives:

1. Explain the different modes of failure.
   a. Describe intermittent failure.
   b. Describe absolute failure.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2
2. Explain methods of failure analysis.
   a. Describe board and component replacement.
   b. Describe analytical analysis.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP2
3. Analyze failure in an analog and digital system.
   a. Explain theory of operation.
   b. Determine failure of the component and justify analysis.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP2
4. Run performance tests using the system specifications.
   a. Interpret operational manual.
   b. Conduct performance test.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP5
5. Explain reliability evaluations and how they relate to system failures.
   a. Describe reliability expectations.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP6
6. Describe analysis procedures in the case of complete system failure.
   a. Determine power availability to components.
   b. Check power supply voltage and amperage.
   c. Check system performance.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP5

7. Explain the role of quality assurance personnel by job and function.
   a. Evaluation of equipment according to specifications.
   b. Burn in equipment for specified time.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP5
8. Maintain an engineering notebook with sufficient accuracy to justify failure analysis methods.
   a. Record symptoms, methods of repair, and results accurately in an engineering notebook.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP4

Course Name: Computer Servicing Lab I

Course Abbreviation: CST 2113

Classification: Vocational-Technical Core (Computer Servicing Technology); Vocational-Technical Elective (Electronics Technology)

Description: This course provides training in the fundamentals of computer servicing. This course includes configuration, test equipment usage, basic disassembly and assembly methods, preliminary tests and diagnostics, schematic interpretation, and building cables. (3 sch: 6 hr. lab)

Pre/Corequisites: Microprocessors (EET 1324), DC Circuits (EET 1114), and AC Circuits (EET 1123)

Competencies and Suggested Objectives:

1. Complete maintenance documentation.
   a. Prepare identification tag.
   b. Prepare equipment sketch.
   c. Prepare repair log.
   d. Prepare invoice.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2
2. Explain anti-static control procedures and equipment for computer repair.
   a. Identify anti-static equipment.
   b. Identify anti-static procedures.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2
3. Set up soldering and desoldering station using correct safety procedures.
   a. Select correct equipment.
   b. Apply correct soldering and desoldering techniques.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
4. Identify tools needed for basic computer servicing.
   a. Describe tools used for basic computer servicing.
   b. Utilize hand tools for basic computer servicing; including, screwdrivers, nut drivers, chip puller, chip inserter, soldering iron, and solder sucker.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
5. Identify the following test equipment:
   a. Demonstrate use of multimeters.
   b. Demonstrate use of the oscilloscope.
   c. Demonstrate use of signal generators.

d. Demonstrate use of frequency counters.
e. Demonstrate use of logic probes.
f. Demonstrate use logic pulser.
g. Demonstrate use logic clips.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5

6. Demonstrate repair procedures for disassembly and reassembly.
   a. Disassemble and reassemble computers.
   b. Disassemble and reassemble printers.
   c. Disassemble and reassemble monitors
   d. Disassemble and reassemble disk drives.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
7. Remove and install electronic components.
   a. Remove and install integrated circuits.
   b. Remove and install transistors.
   c. Remove and install coils.
   d. Remove and install capacitors.
   e. Remove and install resistors.
   f. Remove and install diodes.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
8. Run performance tests on computers and equipment.
   a. Conduct performance tests on computers.
   b. Conduct performance tests on printers.
   c. Conduct performance tests on monitors.
   d. Conduct performance tests on disk drives.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
9. Build and test cables.
   a. Construct control cables.
   b. Test control cables.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
10. Run diagnostic software.
    a. Conduct software diagnosis on system units, disk drives, monitors, keyboards, and printers.

    Related Academic Topics (See Appendix A): C5, C6
    Workplace Skills (See Appendix B): WP6
11. Utilize schematics and troubleshooting procedures.
    a. Identify schematic symbols.
    b. Utilize flowcharts and block diagrams.
    c. Utilize schematics to implement troubleshooting procedures.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP6

12. Isolate malfunction to section, card, and component.
    a. Determine symptoms.
    b. Perform diagnostic procedures.
    c. Isolate malfunction.

    Related Academic Topics (See Appendix A): C5, C6
    Workplace Skills (See Appendix B): WP6

13. Demonstrate the following troubleshooting techniques used in environment investigation to localize problem.
    a. Demonstrate professional attitude.
    b. Utilize professional procedures in customer interview.
    c. Conduct isolation procedures.

    Related Academic Topics (See Appendix A): C5, C6
    Workplace Skills (See Appendix B): WP3

Course Name: Computer Servicing Lab II

Course Abbreviation: CST 2123

Classification: Vocational-Technical Core (Computer Servicing Technology); Vocational-Technical Elective (Electronics Technology)

Description: This course is a continuation of Computer Servicing Lab I with increased emphasis on system analysis and diagnosis of board and component failures. This course places a strong emphasis on laboratory experience with computer repair. (3 sch: 6 hr. lab)

Prerequisites: Computer Servicing I Lab (CST 2113), DC Circuits (EET 1114), and AC Circuits (EET 1123)

Competencies and Suggested Objectives:

1. Maintain service log on individual pieces of equipment.
   a. Identify components being repaired.
   b. Report of symptoms, repair procedures, and parts replaced.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP4
2. Service and align computers and equipment.
   a. Clean computers, disk drives, and printers.
   b. Align disk drives.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP5
3. Service peripherals and components.
   a. Clean peripherals and components.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP5
4. Replace ribbons and filters.
   a. Change ribbons on printers.
   b. Clean/replace filters on power suppliers
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP5
5. Service/replace computer components to include running diagnostic software, observing failure symptoms, disassembly and reassembly, and observing anti-static procedures.
   a. Troubleshoot and service/replace central processing unit (CPU).
   b. Troubleshoot and service/replace memory circuits.
   c. Troubleshoot and service/replace video circuits.
   c. Troubleshoot and service/replace controller boards.
   d. Troubleshoot and service/replace power supply.

e. Troubleshoot keyboard problems.
f. Troubleshoot monitors and liquid crystal displays.
g. Troubleshoot and service/replace printers.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5

Course Name: Special Project

Course Abbreviation: CST 291(1-3)

Classification: Vocational-Technical Elective (Computer Servicing Technology)

Description: This course is designed to provide the student with practical application of skills and knowledge gained in other electronics or electronics-related technical courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Develop a written plan which details the activities and projects to be completed.
   a. Utilize a written plan which details the activities and projects to be completed.
   b. Perform written occupational objectives in the special project.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
2. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
3. Utilize a set of written guidelines for the special project.
   a. Develop and follow a set of written guidelines for the special project.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP1, WP5

Course Name: Supervised Work Experience

Course Abbreviation: CST 292(1-6)

Classification: Vocational-Technical Elective (Computer Servicing Technology)

Description: This course is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in electrical/electronics related programs

Competencies and Suggested Objectives:

1. Apply technical skills needed to be a viable member of the work force.
   a. Prepare a description of technical skills to be developed in the supervised work experience program.
   b. Develop technical skills needed to be a viable member of the work force.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP1
2. Apply skills developed in other program area courses.
   a. Perform skills developed in other program area courses in the supervised work experience program.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP6
3. Apply human relationship skills.
   a. Practice human relationship skills in the supervised work experience program.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP3
4. Apply and practice positive work habits and responsibilities.
   a. Perform assignments to develop positive work habits and responsibilities.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP3
5. Work with instructor and employer to develop written occupational objectives to be accomplished.
   a. Perform written occupational objectives in the supervised occupational experience program.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP6

6. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP6
7. Utilize a set of written guidelines for the Supervised Work Experience.
   a. Develop and follow a set of written guidelines for the Supervised Work Experience.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP6

ELECTRICAL TECHNOLOGY COURSES

108

Course Name: Fundamentals of Electricity

Course Abbreviation: ELT 1102

Classification: Vocational-Technical Core (Electrical Technology); Vocational-Technical Elective (Robotics Technology)

Description: This is a basic course designed to provide fundamental skills associated with all electrical courses. It includes safety, basic tools, special tools, equipment, and introduction to simple AC and DC circuits. (2 sch: 1 hr. lecture; 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environment.
   a. Apply proper safety techniques for all types of circuits and components.
   b. Demonstrate an understanding of and comply with relevant OSHA safety standards.
   c. Demonstrate the use of lockout and tagout electrical procedures.

   Related Academic Topics (See Appendix A): C6, S8
   Workplace Skills (See Appendix B): WP1, WP4
2. Identify, demonstrate, and utilize electrical tools, equipment, and references.
   a. Identify and demonstrate proper use of basic tools. Identify and demonstrate proper use of basic equipment including meters, drills, threaders, conduit benders, and other equipment.
   b. Demonstrate the use of and reading of a rule, tape, and architectural scale.
   c. Locate and interpret information in the NEC Code relative to a specific job.

   Related Academic Topics (See Appendix A): C5, M4
   Workplace Skills (See Appendix B): WP1, WP3
3. Identify and solve problems relating to Ohm's Law, DC, and AC circuits.
   a. List three formulae for Ohm's Law.
   b. Solve problems for an unknown voltage, amperage, resistance, and wattage.
   c. State Kirchoff's voltage and current laws.
   d. Solve problems in DC circuits of unknown voltage, resistance, ampere in series, parallel, and series-parallel circuits.
   e. Solve problems in AC circuits of unknown voltage, resistance, and ampere in series, parallel, and series-parallel circuits.

Related Academic Topics (See Appendix A): S6, M1, M2, M7
Workplace Skills (See Appendix B): WP 5, WP6

4. Identify, list, and distinguish between over current protective devices, load centers, and safety switches.
   a. List five types of over current protective devices and their characteristics.
   b. List installations which require GFCI circuits.
   c. Identify types of safety enclosures and configurations.
   d. Draw and label parts of a breaker load center.
   e. Demonstrate safety rules for working near or at load centers and safety switches, tagouts, and logouts.

   Related Academic Topics (See Appendix A): C5
   Workplace Skills (See Appendix B): WP6

Course Name: Residential/Light Commercial Wiring

Course Abbreviation: ELT 1113

Classification: Vocational-Technical Core (Electrical Technology)

Description: This course provides advanced skills related to the wiring of multi-family and small commercial buildings. This course includes instruction and practice in service entrance installation, specialized circuits, and the use of commercial raceways. (3 sch: 2 hr. lecture, 2 hr. lab)

Pre/Corequisites: Fundamentals of Electricity (ELT 1102) or equivalent

Competencies and Suggested Objectives:

1. Demonstrate the ability to read and utilize drawings of a structure.
   a. Identify residential and commercial symbols used on drawings.
   b. Calculate feeder lead for single, multi-family, and small commercial buildings.
   c. Select the proper size and type of wire, conduit, fittings, load protection devices, and boxes for residential and commercial installation.
   d. Develop a cost estimate for an assigned project to include supply and labor costs.
   e. Interpret a residential/commercial drawing and specifications to determine tools, equipment, and supplies needed for the job.

   Related Academic Topics (See Appendix A): C5, C6, M1, M2, M4, M5, M7
   Workplace Skills (See Appendix B): WP1, WP4
2. Demonstrate the ability to wire a mock-up of a residence/commercial building.
   a. Draw a sketch and install a service entrance and load, center, main branch circuits, feeder circuits, appliance circuits, and various switching circuits, according to current NEC and local codes.
   b. Draw a sketch and install specialized circuits to include telephone, low voltage, and remote control systems.

   Related Academic Topics (See Appendix A): C5
   Workplace Skills (See Appendix B): WP5, WP5

Course Name: Commercial and Industrial Wiring

Course Abbreviation: ELT 1123

Classification: Vocational-Technical Core (Electrical Technology); Vocational-Technical Elective (Automated Manufacturing Technology, Electronics Technology, Robotics Technology)

Description: This course provides instruction and practice in the installation of commercial and industrial electrical services including the types of conduit and other raceways, NEC code requirements, and three-phase distribution networks. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Fundamentals of Electricity (ELT 1102) or equivalent

Competencies and Suggested Objectives:

1. Demonstrate the ability to apply general safety rules.
   a. Explain and demonstrate safety rules and regulations for working near or on load centers and safety switches.
   b. Explain and demonstrate the ability of safe lifting and work habits.

   Related Academic Topics (See Appendix A): C6, S8
   Workplace Skills (See Appendix B): WP4, WP6
2. Demonstrate the ability to install and maintain raceways, conduit, and fittings.
   a. Identify types of raceways, conduit, and fittings.
   b. Apply usage of raceways, conduit, and fittings as required by electrical codes.
   c. Demonstrate the use of mechanical and hydraulic conduit benders to make specified bends to different sized and types of conduit.
   d. Identify other types of raceways and their associated bodies.

   Related Academic Topics (See Appendix A): C6, M2, M7
   Workplace Skills (See Appendix B): WP3, WP5
3. Demonstrate the installation of different types of three-phase service entrances, metering devices, main panels, raceways or ducts, subpanels, feeder circuits, and branch circuits according to electrical codes.
   a. Explain the codes (NEC and local) for the installation of a three-phase service entrance.
   b. Explain safety cautions to be used when installing a three-phase service entrance.
   c. Construct a sketch to install a three-phase service entrance.
   d. Explain terms associated with a three-phase service entrance.
   e. Identify components of a three-phase service entrance.

   Related Academic Topics (See Appendix A): C6, M7
   Workplace Skills (See Appendix B): WP1, WP5, WP6

4. Develop a cost estimate for a job to include supplies and labor costs.
   a. Compute the local labor cost for a given job.
   b. Determine amount of supplies for a given job.
   c. Compute the cost of supplies for a given job.
   d. Justify in writing the total cost for a given job.

   Related Academic Topics (See Appendix A): C4, C5, M1
   Workplace Skills (See Appendix B): WP1, WP4, WP6

Course Name: Electrical Power

Course Abbreviation: ELT 1213

Classification: Vocational-Technical Core (Electrical Technology, Robotics Technology); Vocational-Technical Elective (Electronics Technology)

Description: This course provides skills related to electrical motors and their installation. This course includes instruction and practice in using the different types of motors, transformers, and alternators. (3 sch: 2 hr. lecture, 2 hr. lab)

Pre/Corequisites: Fundamentals of Electricity (ELT 1102) or equivalent

Competencies and Suggested Objectives:

1. Identify and describe safety and environmental protection concerns associated with electrical power equipment.
   a. List safety precautions associated with motors generators, alternators, and transformers.
   b. Demonstrate the procedures for working with and disposing of hazardous materials.

   Related Academic Topics (See Appendix A): C6, S8
   Workplace Skills (See Appendix B): WP4, WP6
2. Demonstrate the ability of working with single-phase electrical components.
   a. Sketch and connect a single-phase transformer for high and low voltage applications.
   b. Identify, sketch, and wire different types of single-phase motors to include split-phase, capacitor start, capacitor run, permanent split capacitor, shaded pole, and repulsion/induction motors.

   Related Academic Topics (See Appendix A): C5, S6
   Workplace Skills (See Appendix B): WP5
3. Demonstrate the ability of working with three-phase electrical components.
   a. Sketch and connect a three-phase AC transformer to included: delta and wye; three wire; and four wire systems.
   b. Identify, draw, and wire different types of three-phase motors to include squirrel cage induction, synchronous, and wound rotor motor.

   Related Academic Topics (See Appendix A): C5, S6
   Workplace Skills (See Appendix B): WP5
4. Demonstrate the ability to work with DC electrical components.
   a. Identify, sketch, and wire different types of DC motors to include series, shunt, and compound wound motors.
   b. Describe characteristics of DC generators and alternators.

   Related Academic Topics (See Appendix A): C5, S6
   Workplace Skills (See Appendix B): WP5

5. Describe the process of synchronizing two alternators.
   a. Sketch and explain the procedures for synchronizing two alternators.
   b. Explain the purpose of synchronizing alternators.
   c. Test the connections to insure proper arrangement.

   Related Academic Topics (See Appendix A): C5, S6
   Workplace Skills (See Appendix B): WP5

Course Name: Motor Maintenance and Troubleshooting

Course Abbreviation: ELT 1223

Classification: Vocational-Technical Core (Electrical Technology); Vocational-Technical Elective (Electronics Technology, Robotics Technology)

Description: This course provides instruction in the principles and practice of electrical motor repair. This course includes topics on the disassembly/assembly and preventive maintenance of common electrical motors. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Fundamentals of Electricity (ELT 1102) or equivalent

Competencies and Suggested Objectives:

1. Demonstrate the ability to apply general safety and safety requirements for working around electric motors.
   a. Apply principles of safety in the use and repair of electrical motors.
   b. Describe safety procedures to utilize during connecting, operating, and repairing of electrical motors.

   Related Academic Topics (See Appendix A): C6, S8
   Workplace Skills (See Appendix B): WP1, WP4
2. Apply the principles of the use of instruments and tools in maintaining, troubleshooting, and operating electrical motors.
   a. Identify, describe, and demonstrate use of instruments and tools to maintain, troubleshoot, and repair motors, to include megohm-meters and volt-amp meters.
   b. Describe the procedures for the maintenance, testing, and/or repair of instruments and tools.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
3. List and describe functions of electric motors.
   a. List and describe functions of the major parts and windings of single-phase motors.
   b. List and describe the functions of split-phase, capacitor start, capacitor start-capacitor run, and permanent split capacitor electric motors.
   c. Describe and list the functions of a shaded pole and repulsion/induction electric motors.
   d. List and describe functions of major parts and windings of three-phase motors to include squirrel cage induction, synchronous, and wound rotor motors.
   e. List and describe functions of the major parts and windings of DC motors to include series, shunt, and compound wound motors.

f. Disassemble, troubleshoot, repair, and reassemble electric motors of each type.

g. Develop a preventive maintenance program for three types of electric motors above.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP1, WP6

Course Name: Branch Circuit and Service Entrance Calculations

Course Abbreviation: ELT 1253

Classification: Vocational-Technical Elective (Electrical Technology)

Description: This is a course in calculating circuit sizes for all branch circuits and service entrances in residential installation. (3 sch: 2 hr. lecture, 2 hr. lab)

Pre/Corequisites: None

Competencies and Suggestive Objectives:

1. Explain the sizing and color of equipment grounding conductors for all branch circuits.
   a. Explain the different colors of equipment grounding conductors for all ranch circuits.
   b. Explain the equipment grounding conductor sizes in relationship to the rating or setting of the automatic overcurrent device ahead of the equipment (per article 250-95 NEC).

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
2. Explain and demonstrate the method of determining the minimum number of general purpose branch circuits needed in a residential structure.
   a. Calculate the usable square footage of a dwelling for general purpose application.
   b. Compute the minimum wattage by NEC standards for total watts for general purpose lighting and appliance circuits.
   c. Compute the minimum number of 15 amp or 20 amp general purpose branch circuits.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
3. Explain and demonstrate the procedure for calculating the branch circuit sizes for individual branch circuits for residential wiring.
   a. Calculate the branch circuit conductor size for motors according to NEC Article 430, Section B.
   b. Calculate the branch circuit conductor size for air conditioning and refrigeration equipment according to NEC Article 440, Section D.
   c. Calculate the branch circuit size for appliances according to NEC Article 422, Section B.
   d. Calculate the branch circuit size for heat according to NEC Article 424, Section A.

   Related Academic Topics (See Appendix A): C5, C6, M2
   Workplace Skills (See Appendix B): WP5

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4. Explain and demonstrate the procedure for calculating the minimum number of branch circuits of the small appliance and laundry types.
   a. Explain the circuit size and specified area use of the small appliance and laundry branch circuits.
   b. Explain the exceptions permitted by the NEC as to circuit area usage of small appliance branch circuits.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP5
5. Explain and demonstrate the procedure for calculating the residential service entrance conductor size using the optional method NEC 220, Section C.
   a. Calculate the wattage of the small appliance and laundry circuits as specified in Section 220-16, NEC.
   b. Calculate the wattage of general purpose branch circuits as specified in Table 220-3 (B), NEC.
   c. Calculate the wattage of all appliances that may be permanently connected or on a specific circuit.
   d. Demonstrate the procedure for calculating the heat and air conditioning load as specified in Table 220-30, Section C, NEC.

   Related Academic Topics (See Appendix A): C5, C6, M2
   Workplace Skills (See Appendix B): WP6

Course Name: Blueprint Reading/Planning the Residential Installation

Course Abbreviation: ELT 1263

Classification: Vocational-Technical Elective (Electrical Technology)

Description: This course provides knowledge of architectural symbols and electric symbols needed to read blueprints. All elevations and various plans associated with electrical wiring will be studied. Blank blueprints will be provided and a list of all appliances and their amperage will be supplied. The blanks will be filled with receptacles, switches, and lighting outlets as required by NEC. Circuit layouts for all switching will be demonstrated. All branch circuits will be plotted on the blueprint. (3 sch: 2 hr. lecture, 2 hr. lab)

Pre/Corequisites: None

Competencies and Suggested Objectives:

1. Explain the ANSI symbols that are used in blueprint reading.
   a. List and explain symbols used for circuits.
   b. List and explain symbols used for lights, switches, appliances, and special connectors.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
2. Explain the various plans and elevations critical to blueprint reading.
   a. List the various plans.
   b. Name the principle elevations.
   c. Draw a basic floor plan.
   d. Draw the four principle elevations.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP6
3. Use the exterior elevations to determine service entrance locations and heights.
   a. Determine proper heights to install wall bracket lights and weatherproof GFCI outlets.
   b. Determine finished grade and exterior structure finish.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP5
4. Demonstrate the use of interior elevations to properly locate vertical wall receptacles, switches, and lighting outlets.
   a. Sketch the location of all receptacles.
   b. Sketch the location of all lights and switches.

c. Sketch the location of all special outlets.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5

5. Demonstrate the ability to prepare a blueprint to meet the NEC minimum requirements.
   a. Locate all receptacles, switches, and lighting outlets in each room.
   b. Determine the wiring circuits for all light switching.
   c. Lay out all appliance, multi-wire, individual, and general purpose branch circuits.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Switching Circuits for Residential, Commercial, and Industrial Application

Course Abbreviation: ELT 1273

Classification: Vocational-Technical Elective (Electrical Technology, Electronics Technology)

Description: This course is designed to introduce the student to the various methods by which single pole, 3-way, and 4-way switches are used in residential, commercial, and industrial installations. This course also includes the installation and operation of low voltage, remote control switching. (3 sch: 2 hr. lecture, 2 hr. lab)

Co/Prerequisites: None

Competencies and Suggested Objectives:

1. Explain and demonstrate how to move various switching circuits.
   a. Explain the mechanical and electrical operation of single pole and 4-way switches using the various wiring arrangements.
   b. Demonstrate the single pole switching arrangements with 2-wire when the lighting outlet and switch are fed.
   c. Demonstrate the switching arrangement for 3-way and 4-way switching circuits using 2-wire when the lighting outlet and switch are fed.
   d. Demonstrate the various 3-way and 4-way switching circuits using 3-wire when the lighting outlet and switch are fed.
   e. Demonstrate Objectives 1a-1d using a conduit raceway and pulling the circuit conductors.

   Related Academic Topics (See Appendix A): C1, C3, C4
   Workplace Skills (See Appendix B): WP4, WP5, WP6
2. Explain and demonstrate the methods for low voltage remote and relay control wiring.
   a. Demonstrate the procedure for installing the outletmounting relay system.
   b. Demonstrate the procedure for installing the gang mountned relay system. The 24-volt transformer will be mounted at the relay location.
   c. Demonstrate the procedure for installing the zone mounted relay system.

   Related Academic Topics (See Appendix A): C1, C3, C4
   Workplace Skills (See Appendix B): WP4, WP5, WP6

Course Name: Estimating the Cost of a Residential Installation

Course Abbreviation: ELT 1283

Classification: Vocational-Technical Elective (Electrical Technology)

Description: A course to provide a probable cost of a residential installation. It will include a study of the specifications set forth for a particular structure. (3 sch: 2 hr. lecture, 2 hr. lab)

Co/Prerequisites: None

Competencies and Suggested Objectives:

1. Develop and complete an estimating form to determine the total projected cost of materials and labor by using the results of a time and motion study, actual cost of materials, and margin of profit.
   a. Prepare a lighting fixture schedule for a residential structure by determining which circuits require specific lights for the individual rooms.
   b. Prepare a branch circuit material schedule for a residence.
   c. Prepare a labor unit schedule for a residential structure.
   d. Prepare an estimate of materials used in an installation.

   Related Academic Topics (See Appendix A): C1, C2, C3
   Workplace Skills (See Appendix B): WP4, WP5, WP6
2. Develop a branch circuit schedule for a residence.
   a. Determine which rooms are on a particular branch circuit.
   b. Determine the number of lighting outlets that are on the particular branch circuit.
   c. Determine the number of switch outlets that are on a particular branch circuit.
   d. Determine the number of receptacle outlets that are on a particular branch circuit.

   Related Academic Topics (See Appendix A): C1, C2, C3
   Workplace Skills (See Appendix B): WP4, WP5, WP6

Course Name: Motor Control Systems

Course Abbreviation: ELT 1413

Classification: Vocational-Technical Core (Electrical Technology, Automated Manufacturing Technology, Instrumentation Technology, Robotics Technology); Vocational-Technical Elective (Electronics Technology)

Description: This is a course in the installation of different motor control circuits and devices. Emphasis is placed on developing the student's ability to diagram, wire, and troubleshoot the different circuits and mechanical control devices. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Fundamentals of Electricity (ELT 1102) or equivalent

Competencies and Suggested Objectives:

1. Demonstrate the ability to install and troubleshoot different control circuits and devices.
   a. Sketch, wire, and troubleshoot a two-wire and three-wire motor control circuit with indicating pilot lights.
   b. Sketch, wire, and troubleshoot an on- and off-delay timer circuit.
   c. Sketch, wire, and troubleshoot multi-control manual station.
   d. Sketch, wire, and troubleshoot a "hands-off-automatic" control station.
   e. Sketch, wire, and troubleshoot a jog-forward/jog- reverse control.
   f. Sketch, wire, and troubleshoot a drum-switch forward and reverse control station.

   Related Academic Topics (See Appendix A): C5, C6, M2, M7
   Workplace Skills (See Appendix B): WP1, WP5, WP6

Course Name: Solid State Motor Control

Course Abbreviation: ELT 2424

Classification: Vocational-Technical Core (Electrical Technology), Vocational-Technical Elective (Electronics Technology, Instrumentation Technology, Robotics Technology)

Description: This course deals with the principles and operation of solid state motor control. This course includes instruction and practice in the design, installation, and maintenance of different solid state devices for motor control. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Motor Control Systems (ELT 1413)

Competencies and Suggested Objectives:

1. Demonstrate the ability to apply general safety and safety requirements for working on and around electrical motors.
   a. Apply principles of safety in the use of electrical motors.
   b. Describe safety procedures to utilize during connecting and operating electric motors.

   Related Academic Topics (See Appendix A): C6, S8
   Workplace Skills (See Appendix B): WP1, WP4
2. Demonstrate the principles of solid state motor controls.
   a. Identify electronic and industrial symbols used to represent logic gates in solid state schematics.
   b. Describe the operation of the different types of industrial and electronic logic gates.
   c. Draw a solid state logic circuit to replace a manual control station.
   d. Troubleshoot and repair/replace solid state devices to include memory devices, flip/flops, adjustable time delays, starting and stopping sequences, and looping.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP4
3. Demonstrate the ability to discuss and operate AC and DC variable speed drives.
   a. Discuss the operation of a DC variable speed drive.
   b. Discuss the operation of an AC variable speed drive.
   c. Connect and operate a DC and AC variable speed drive.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5

Course Name: Programmable Logic Controllers

Course Abbreviation: ELT 2613

Classification: Vocational-Technical Core (Electrical Technology, Robotics Technology, Instrumentation Technology); Vocational-Technical Elective (Electronics Technology, Automated Manufacturing Technology)

Description: This course provides instruction and practice in the use of programmable logic controllers (PLC's) in modern industrial settings. This course includes instruction in the operating principles of PLC's and practice in the programming, installation, and maintenance of PLC's. (3 sch: 2 hr. lecture, 2 hr. lab.)

Prerequisites: Motor Control Systems (ELT 1413)

Competencies and Suggested Objectives:

1. Describe the principles of PLC's.
   a. Identify components and operational principles of PLC's.
   b. Differentiate between a PLC and a computer.
   Related Academic Topics (See Appendix A): C1
   Workplace Skills (See Appendix B): WP1, WP6
2. Utilize the different types of PLC hardware.
   a. Identify and wire different types of input and output modules.
   b. Identify different types of PLC processor modules, memory capabilities and programming devices.
   Related Academic Topics (See Appendix A): C1
   Workplace Skills (See Appendix B): WP5, WP6
3. Demonstrate mastery of numbering systems, encoding/decoding, logical operations, and Boolean expressions.
   a. Convert numbers from one system to another.
   b. Explain logical operations using truth tables, Boolean equations, and ladder diagrams.
   Related Academic Topics (See Appendix A): C5, M1
   Workplace Skills (See Appendix B): WP5, WP6
4. Demonstrate the ability to program all types of internal and discrete instructions.
   a. Program examine on and off instructions.
   b. Program on-delay and off-delay instructions.
   c. Program up-counter and down-counter instructions.
   d. Program sequencer instructions for real world output devices.

e. Program latch and unlatch instructions.

Related Academic Topics (See Appendix A): M7

Workplace Skills (See Appendix B): WP5, WP6

5. Demonstrate the ability to troubleshoot and maintain different programmable controllers systems.
   a. Identify and troubleshoot the power supply.
   b. Identify and troubleshoot the I/0 cards.
   c. Identify and troubleshoot real world inputs and outputs.

   Related Academic Topics (See Appendix A): C6

   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Advanced Programmable Logic Controllers

Course Abbreviations: ELT 2623

Classification: Vocational-Technical Elective (Robotics Technology)

Description: This is an advanced PLC course which provides instruction in the various operations, installations, and maintenance of electric motor controls. This course will provide information in such areas as sequencer, program control, block transfer used in analog input and output programming, and logical and conversion instructions. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Programmable Logic Controllers (ELT 2613) and Motor Control Systems (ELT 1413)

Competencies and Suggested Objectives:

1. Demonstrate the ability to program all types of high order instructions.
   a. Calculate and develop mathematical instructions to include addition, substraction, multiplication, and division.
   b. Program and setup a chart for input and output sequencer combination.
   c. Program a shift left and a shift right instructions.
   d. Program a block transfer read and a block transfer write instructions.
   e. Program and set up an analog input and output card using PLC software.

   Related Academic Topics (See Appendix A): C1, M1, M2, M7
   Workplace Skills (See Appendix B): WP2, WP5, WP6
2. Demonstrate the ability to troubleshoot and maintain advanced PLC controls.
   a. Troubleshoot an analog input and output card.
   b. Troubleshoot communication devices used in networking.

   Related Academic Topics (See Appendix A): C1, M2, M7
   Workplace Skills (See Appendix B): WP1, WP5, WP6

Course Name: Special Project

Course Abbreviation: ELT 291(1-3)

Classification: Vocational-Technical Elective (Electrical Technology)

Description: This course is designed to provide the student with practical application of skills and knowledge gained in other electronics or electronics-related technical courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Develop a written plan and blueprints which details the activities and projects to be completed.
   a. Utilize a written plan which details the activities and projects to be completed.
   b. Perform written occupational objectives in the special project.

   Related Academic Topics (See Appendix A): C6, S8
   Workplace Skills (See Appendix B): WP1, WP4
2. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP4
3. Utilize a set of written guidelines for the special project.
   a. Develop and follow a set of written guidelines for the special project.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5

Course Name: Supervised Work Experience

Course Abbreviation: ELT 292(1-6)

Classification: Vocational-Technical Elective (Electrical Technology)

Description: This course is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in electrical/electronics related programs

Competencies and Suggested Objectives:

1. Apply technical skills needed to be a viable member of the work force.
   a. Prepare a description of technical skills to be developed in the supervised work experience program.
   b. Develop technical skills needed to be a viable member of the work force.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1
2. Apply skills developed in other program area courses.
   a. Perform skills developed in other program area courses in the supervised work experience program.
   Related Academic Topics (See Appendix A): None
   Workplace Skills (See Appendix B): WP6
3. Apply human relationship skills.
   a. Practice human relationship skills in the supervised work experience program.
   Related Academic Topics (See Appendix A): None
   Workplace Skills (See Appendix B): WP3
4. Apply and practice positive work habits and responsibilities.
   a. Perform assignments to develop positive work habits and responsibilities.
   Related Academic Topics (See Appendix A): None
   Workplace Skills (See Appendix B): WP3
5. Work with instructor and employer to develop written occupational objectives to be accomplished.
   a. Perform written occupational objectives in the supervised occupational experience program.
   Related Academic Topics (See Appendix A): None
   Workplace Skills (See Appendix B): WP6

6. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Utilize a set of written guidelines for the Supervised Work Experience.
   a. Develop and follow a set of written guidelines for the Supervised Work Experience.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

ELECTRONICS TECHNOLOGY COURSES

Course Name: Fundamentals of Electronics

Course Abbreviation: EET 1102

Classification: Vocational-Technical Core (Automated Manufacturing Technology, Communications Electronics Repair Technology, Computer Servicing Technology, Electronics Technology, Instrumentation Technology, Robotics Technology, Telecommunications Technology)

Description: This course is designed to provide fundamental skills associated with all electronics courses. This course includes safety, breadboarding, use of calculator, test equipment familiarization, soldering, electronic symbols, and terminology. (2 sch: 1 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environments.
   a. Apply proper safety techniques for all types of circuits and components.
   b. Demonstrate an understanding of and comply with relevant OSHA safety standards.

   Related Academic Topics (See Appendix A): C5, C6, S8
   Workplace Skills (See Appendix B): WP1, WP4
2. Demonstrate and utilize proper breadboarding techniques.
   a. Identify the various electronic components and schematic symbols.
   b. Identify the various resistor and capacity codes.
   c. Layout a breadboard by the use of a schematic.
   d. Demonstrate forming components to fit into a breadboard.
   e. Demonstrate techniques for selecting and forming wires to make connections.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3
3. Demonstrate proficiency in the use of a calculator.
   a. Use SI symbols and prefixes to describe electrical values.
   b. Manipulate numbers in mathematical operations using scientific notation, engineering notation, and E notation to aid in mathematical circuit analysis.
   c. Perform basic algebraic operations using electronic equations to express the rules of symbol transformation.
   d. Perform basic trigonometry to include Pythagorean Theorem, sine function, cosine function, and tangent function.

e. Perform practical math in solving ratio, percentage, propriations, powers, and roots of numbers on digital conversions.

Related Academic Topics (See Appendix A): M1, M3, M7
Workplace Skills (See Appendix B): WP5, WP6

4. Demonstrate the proper use and operation of test equipment.
   a. Demonstrate the use and care of test instruments including volt-ohm meters, current meters, oscilloscopes, etc.
   b. Explain the cause and effects of current and voltage circuit loading.
   c. Describe the differences between analog and digital multimeters.
   d. Discuss the advantages and disadvantages of analog and digital multimeters.
   e. Explain zeroing the ohmmeter prior to use and effects of battery drain on its accuracy.
   f. Demonstrate proper troubleshooting techniques by use of selected meters.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP5
5. Demonstrate proper soldering and desoldering techniques.
   a. Apply acceptable soldering/desoldering techniques, including thru-hole and surface mount devices.
   b. Apply acceptable standards of proper solderless connections.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: DC Circuits

Course Abbreviation: EET 1114

Classification: Vocational-Technical Core

Description: This course is designed for students to know the principles and theories associated with DC circuits. This course includes the study of electrical circuits, laws and formulae, and the use of test equipment to analyze DC circuits. (4 sch: 2 hr. lecture, 4 hr. lab)

Pre/Corequisites: Fundamentals of Electronics (EET 1102) or equivalent

Competencies and Suggested Objectives:

1. Demonstrate and apply an understanding of a basic electrical circuit.
   a. Write numbers in scientific and engineering notation.
   b. Perform mathematical manipulations with numbers expressed in engineering notation.
   c. Explain the basic structure of matter to include the atom and element.
   d. Explain the laws of electrical charge.
   e. Differentiate the characteristics between conductors, semiconductors, and insulators.
   f. Demonstrate the ability to determine resistor types, value, tolerance, and power rating.
   g. Differentiate between DC circuit schematic symbols.
   h. Demonstrate proper techniques for measuring resistance.
   i. Discuss methods of generating electricity.
   j. Explain theories of current flow including electron and conventional method.
   k. Demonstrate an understanding of principles of and operation of batteries.
   l. Explain and demonstrate an understanding of measurement of resistance of conductors and insulators and the computation of conductance.

   Related Academic Topics (See Appendix A): C6, S6, M1, M7
   Workplace Skills (See Appendix B): WP1, WP4, WP6
2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.
   a. Explain the relationship between voltage, current, and resistance in a DC circuit.
   b. State three equations used to express Ohm's law.
   c. Analyze circuit parameters using Ohm's law.
   d. Explain how power is developed in a circuit.
   e. State three forms of power equations.
   f. Demonstrate techniques for determining a power.

g. Explain proper techniques for connecting a voltmeter to measure voltage.
h. Explain proper techniques for connecting current meter to measure current.
i. Measure voltage.
j. Measure resistance.
k. Measure current.

Related Academic Topics (See Appendix A): C5, S6, M1
Workplace Skills (See Appendix B): WP4, WP6

3. Analyze and evaluate the parameters of a series circuit.
   a. Identify series circuits.
   b. Compute total resistance of a series circuit.
   c. Compute current in a series circuit using Ohm's Law.
   d. Explain why current is the same at all points in a series circuit.
   e. State and apply Kirchoff's Voltage Law in analysis of series circuits.
   f. Explain why series circuits are known as a voltage divider.
   g. Compute voltage props in a series circuit using Ohm's Law.
   h. Compute the power developed by each resistor and the total power of a series circuit.
   i. Explain the difference between series-aiding and series-opposing voltage sources.
   j. Construct, analyze, and troubleshoot a series circuit.

   Related Academic Topics (See Appendix A): C5, C6, M1, M7
   Workplace Skills (See Appendix B): WP4, WP5, WP6

4. Analyze and evaluate the parameters of a parallel circuit.
   a. Identify parallel circuits.
   b. Compute total resistance of a parallel circuit.
   c. Utilize Ohm's Law to solve circuit parameters of parallel DC circuit.
   d. Explain why voltage is the same across all branches of a parallel circuit.
   e. State and apply Kirchoff's Current Law in the analysis of parallel circuit.
   f. Explain why a parallel circuit is a current divider.
   g. Compute branch currents in a parallel resistive circuit using the current divider equation.
   h. Construct, analyze, and troubleshoot a parallel circuit.

   Related Academic Topics (See Appendix A): C5, C6, M1, M7
   Workplace Skills (See Appendix B): WP5, WP6

5. Analyze and evaluate the parameters of a series-parallel circuit.
   a. Differentiate between series and parallel in a series-parallel resistive circuit.
   b. Compute total resistance of a series-parallel circuit.
   c. Analyze series-parallel circuits for the current through and the voltage across each component.
   d. Construct, analyze, and troubleshoot a series-parallel circuit.
   e. Analyze loaded and unloaded voltage dividers.
   f. Explain the operations and applications of a wheat stone bridge.

g. Construct a resistive bridge circuit and measure an unknown resistance.
h. Measure the error voltage of an unbalance bridge.

Related Academic Topics (See Appendix A): C5, C6, M1
Workplace Skills (See Appendix B): WP5, WP6

6. Apply network theorems to the analysis of complex circuits.
   a. Perform voltage source to current source conversions and also perform current source to voltage source conversions.
   b. Solve for unknown voltages and currents using superposition theorem on circuits containing multiple voltage sources.
   c. Analyze a multi-source circuit and prove superposition theorem.
   d. Reduce series-parallel resistive circuits to their Thevein's equivalent.
   e. Measure the Thevein's voltage and resistance of a DC circuit.
   f. Reduce series-parallel resistive circuits to their Norton equivalent.
   g. Measure the Norton current and Norton resistance of a series circuit.
   h. Perform conversions between Thevein's and Norton equivalent circuit.
   i. Explain the conditions under which maximum power occurs.
   j. Construct a circuit and prove maximum power transfer theorem.

   Related Academic Topics (See Appendix A): C5, C6, M1, M3
   Workplace Skills (See Appendix B): WP3, WP6

7. Explain capacitance and demonstrate its application in DC and transient circuits.
   a. Explain capacitance and terms related to capacitance.
   b. Explain the construction of a capacitor and its relationship to capacitance value.
   c. Draw the symbols for capacitance and identify the unit of measurement for capacitance.
   d. Explain how the capacitor is charged and discharged.
   e. Identify various types of capacitors.
   f. Explain specifications of connections including values and voltage ratings.
   g. Calculate the total capacitance of capacitors in series and in parallel.
   h. Define and compute RC time constant.
   i. Measure capacitance in series and in parallel.
   j. Fabricate, observe, and measure the charge and discharge of capacitor voltage in a series RC circuit.
   k. Explain and demonstrate techniques for troubleshooting capacitors.

   Related Academic Topics (See Appendix A): C5, C6, M1, M3, M7
   Workplace Skills (See Appendix B): WP4, WP5, WP6

8. Explain inductance and demonstrate its application in DC and transient circuits.
   a. Explain the laws of repulsion and attraction between two magnetic poles.
   b. Explain how an electromagnet is developed.
   c. Explain several applications of magnetism.
   d. Define inductance and the terms relating to inductance.
   e. Sketch the symbols for inductors and identify the unit of measurements for inductance.

f. List the factors that determine the value of an inductor and state whether the factors have a direct or inverse effect on the value.
g. Calculate total inductance in series and parallel.
h. Explain the Henry in terms of induced voltage and the rate of charge of current with respect to time.
i. Calculate the time constant for an RL circuit.
j. Fabricate and demonstrate the operation of an RL circuit.
k. Explain and demonstrate techniques for troubleshooting DC circuits.

Related Academic Topics (See Appendix A): C5, C6, M1, M3, M7
Workplace Skills (See Appendix B): WP4, WP5, WP6

Course Name: AC Circuits

Course Abbreviation: EET 1123

Classification: Vocational-Technical Core

Description: This course is designed to provide students with the principles and theories associated with AC circuits. This course includes the study of electrical circuits, laws and formulae, and the use of test equipment to analyze AC circuits. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: DC Circuits (EET 1114) and Fundamentals of Electronics (EET 1102) or equivalent

Competencies and Suggested Objectives:

1. Analyze a sine wave and explain its characteristics and application to AC circuits.
   a. Explain and calculate the following AC values: period, frequency, time, angle, instantaneous values of voltage and current, peak, peak-to-peak voltage and current, RMS voltage and current, average voltage and current, and power.
   b. Analyze AC resistive circuits and solve for voltage drops, branch currents, and power dissipations.
   c. Explain and use phasers to represent the relative phase and amplitude of AC voltages and currents.
   d. Explain and use voltage and power decibels.
   e. Use the oscilloscope to measure AC voltage and frequency.
   f. Use a frequency counter to measure frequency.
   g. Use multimeters to measure AC voltage and current.
   h. Define the square and sawtooth waves in terms of harmonic content.
   i. Determine the duty cycle of a square wave.
   j. Determine period and frequency for sine waves, square waves, sawtooth waves, and triangle waves.

   Related Academic Topics (See Appendix A): C1, C2, S6, M1, M2, M4, M5, M7

   Workplace Skills (See Appendix B): WP1, WP4, WP5
2. Analyze inductive and capacitive reactance in series and parallel circuits.
   a. Calculate inductive reactance (X_L) using Ohm's Law or the inductive reactance formula when signal frequency and inductance are known.
   b. Solve for signal frequency when inductance and inductive reactance are known, or inductance when frequency and inductive reactance are known.

c. Calculate capacitive reactance (X_c) using Ohm's Law or the capacitive reactance formula when signal frequency and capacitance are known.
d. Solve for signal frequency when capacitance and capacitive reactance are known, or capacitance when frequency and capacitive reactance are known.
e. Calculate all voltages and currents in series and parallel capacitive and inductive circuits.

Related Academic Topics (See Appendix A): C1, M3, S6
Workplace Skills (See Appendix B): WP4, WP6

3. Analyze transformer voltage, current, impedance transformations, and applications.
   a. Explain how mutual inductance affects transformer action.
   b. Calculate primary and secondary transformer voltage and current as related to the transformer's turns ratio.
   c. Explain the theory of reflected impedance between the primary and secondary, or secondaries, of transformers.
   d. Calculate reflected impedance given a transformer turns ratio and secondary load impedance.
   e. Explain various transformer ratings, such as voltage , current, power, impedance, frequency, and efficiency.
   f. Explain various transformer losses, such as winding losses and core losses.
   g. Discuss a variety of transformer types and applications.
   h. Construct transformer circuits and measure voltages and currents as calculated.
   i. Troubleshoot a transformer using an ohmmeter and/or voltmeter.

   Related Academic Topics (See Appendix A): C1, C6, M1, M2, M7
   Workplace Skills (See Appendix B): WP4, WP5, WP6

4. Explain RLC non-resonant circuits.
   a. Perform algebraic operations with complex numbers in rectangular and polar form, and convert from one form to the other.
   b. Use basic trigonometric functions and the Pythagorean theorem for right triangles in the analysis of AC circuits.
   c. Calculate impedance, current, voltages, and power for series RL, RC, and RCL circuits.
   d. Represent series AC circuits with voltage, impedance, and power phasers in phasor diagrams.
   e. Use an RL and RC circuit as a lead or lag circuit.
   f. Express phase relationships in terms of time.
   g. Explain and calculate AC circuit efficiency.
   h. Construct RC, RL, and RCL series circuits and use a dual-trace oscilloscope for sine-wave-voltage phase comparison.
   i. Use a vector impedance meter to measure an unknown AC circuit impedance.

j. Calculate branch currents and total current for parallel RL, RC, and RCL circuits.
k. Calculate the phase angle for each branch current and total current of a parallel AC circuit.
l. Calculate real power, reactive power, apparent power, and the power factor for parallel AC circuits.
m. Calculate the power efficiency of a parallel AC circuit.
n. Correct the power factor of a parallel AC circuit by changing the size of L or C.
o. Construct and analyze RC, RL, and RCL parallel AC circuits.

Related Academic Topics (See Appendix A): C1, M1, M3, M7
Workplace Skills (See Appendix B): WP5, WP6

5. Explain RLC resonant circuits.
   a. Name applications for series and parallel resonant circuits.
   b. List all of the significant parameters and characteristics of series and parallel resonant circuits.
   c. Explain the characteristic graphs for series and parallel resonant circuits.
   d. Calculate the resonant frequency for series and parallel resonant circuits.
   e. Calculate circuit Q and bandwidth when the resonant frequency and total circuit resistance are known.
   f. Calculate bandpass when the resonant frequency and bandwidth are known.
   g. Calculate the proper size capacitor to resonate with a given inductor at a specified resonant frequency.
   h. Calculate the proper amount of total resistance needed to provide a specified bandwidth for a given series resonant circuit.
   i. Describe a high-Q inductor and capacitor in terms of construction and characteristics.
   j. Accurately test series and parallel resonant circuits using a variable-frequency generator and an oscilloscope.
   k. Explain similarities and differences between series and parallel resonance.

   Related Academic Topics (See Appendix A): C1, C6, M1, M3, M7
   Workplace Skills (See Appendix B): WP5, WP6

6. Explain and classify filters.
   a. Identify filters by type and configuration.
   b. Discuss and analyze filter types in terms of frequency response, phase response, insertion loss, and rolloff shape.
   c. Discuss practical applications of each of the basic filter types.
   d. Predict and plot frequency response for common filter types using the insertion loss formula.
   e. Analyze RL, RC, and RCL highpass filters.
   f. Analyze RL, RC, and RCL lowpass filters.
   g. Analyze series and parallel resonant bandpass filters.

h. Analyze series and parallel resonant bandstop filters.
Related Academic Topics (See Appendix A): C1, C6
Workplace Skills (See Appendix B): WP3, WP6

Course Name: Digital Electronics

Course Abbreviation: EET 1214

Classification: Vocational-Technical Core (Computer Servicing Technology, Communications Electronics Repair Technology, Electronics Technology, Instrumentation Technology, Robotics Technology, Telecommunications Technology)

Description: This course is designed to introduce the student to number systems, logic circuits, counters, registers, memory devices, combination logic circuits, Boolean algebra, and a basic computer system. (4 sch: 3 hr. lecture, 2 hr. lab)

Corequisites: Fundamentals of Electronics (EET 1102) or equivalent

Competencies and Suggested Objectives:

1. Perform mathematical operations in digital number systems.
   a. Convert between binary, octal, hex, and decimal values.
   b. Add and subtract binary, octal, hex numbers.
   c. Subtract binary numbers using both ones and twos complements.
   d. Generate and interpret even and odd parity.
   e. Use the terms bit, byte, MSB, LSB, and nibble appropriately.
   f. Encode and decode ASCII codes from code charts.

   Related Academic Topics (See Appendix A): M1
   Workplace Skills (See Appendix B): WP4, WP6
2. Classify logic gates and explain their functions.
   a. Describe and complete truth tables for OR, AND, NOT, NOR, NAND, and XOR logic gates.
   b. Sketch schematic diagrams for logic gates.
   c. Solve timing diagrams for logic gates.
   d. Wire and test logic gates.
   e. Write Boolean expression for logic gates.

   Related Academic Topics (See Appendix A): M1
   Workplace Skills (See Appendix B): WP4, WP6
3. Construct and analyze combination logic circuits, including encoders/decoders.
   a. Develop Boolean expressions from gate circuits.
   b. Develop Gate circuits from Boolean expressions.
   c. Develop Boolean expressions from truth tables.
   d. Develop Truth tables from Boolean expressions.
   e. Interpret digital IC specifications sheets.

   Related Academic Topics (See Appendix A): M1
   Workplace Skills (See Appendix B): WP3, WP6

4. Minimize logic circuits using Boolean algebra and Karnaugh mapping.
   a. Write and describe the Boolean algebra theorems.
   b. Apply Demorgans theorem to convert between OR and AND logic.
   c. Apply Boolean algebra to minimize given Boolean expressions.
   d. Convert between sum of products and product of sums.
   e. Use Karnaugh maps to simplify Boolean expressions.

   Related Academic Topics (See Appendix A): C5, C6, M1
   Workplace Skills (See Appendix B): WP3, WP6
5. Compare and interface logic families and explain specifications of each.
   a. Describe characteristics of the TTL subfamilies 74XX, 74LXX, 74SXX, 74LSXX, 74ALSXX and 74ASXX.
   b. Describe the characteristics of the CMOs subfamilies 4XXX, 4XXXB, 74CXX, and 74HCXX.
   c. Contrast the TTL family with the CMOS family.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
6. Analyze the flip flop circuits and explain their operations.
   a. Describe the operation of simple NOR and NAND latch circuits.
   b. Describe the operation of the latch and flip-flop types listed:
      (1) RS latch
      (2) D flip-flop
      (3) JK flip-flops

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
7. Analyze sequential logic circuits and demonstrate the operations of shift registers, counters, and wave form generators.
   a. Construct and demonstrate binary ripple and synchronous counters.
   b. Construct and demonstrate shift registers and ring counters.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
8. Explain and demonstrate the principles and operation of multiplexer/demultiplexer circuits display.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP3
9. Explain and demonstrate the principles and operations of the A/D and D/A digital circuits.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP3
10. Analyze principles and operations of digital display devices.
    a. Construct and demonstrate 7-segment LED digital displays.
    b. Describe the principle at operation for multiplying multidigit displays.
    c. Contrast LED and LCD digital display devices.

    Related Academic Topics (See Appendix A): C5, C6
    Workplace Skills (See Appendix B): WP2, WP3

11. Explain the operation of basic memory circuits.
    a. Describe the characteristics of memory types including; static RAM, Dynamic RAM, PROM, and EPROM.
    b. Interpret manufacturers data sheets for memory integrated circuits.

    Related Academic Topics (See Appendix A): C5, C6
    Workplace Skills (See Appendix B): WP2, WP3

Course Name: Solid State Devices and Circuits

Course Abbreviation: EET 1314

Classification: Vocational-Technical Core (Automated Manufacturing Technology, Communications Electronics Repair Technology, Computer Servicing Technology, Electrical Technology, Electronics Technology, Instrumentation Technology, Robotics Technology, Telecommunications Technology)

Description: This course is designed to introduce the student to active devices which include PN junction diodes, bipolar transistors, bipolar transistor circuits, and unipolar devices with emphasis on low frequency application and troubleshooting. (4 sch: 2 hr. lecture, 4 hr. lab)

Pre/Corequisites: AC Circuits (EET 1123) and DC Circuits (EET 1114)

Competencies and Suggested Objectives:

1. Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
   a. Explain basic atomic structure.
   b. Define intrinsic, p-type, and n-type.
   c. Analyze an unbiased pn junction.
   d. Analyze a forward biased pn junction.
   e. Analyze a reverse biased pn junction.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3
2. Explain semiconductor diode theory and apply to diode circuits.
   a. Describe the characteristics of a diode.
   b. Analyze and demonstrate half wave rectifier circuit.
   c. Analyze and demonstrate full wave rectifier circuit.
   d. Analyze and demonstrate bridge rectifier circuit.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
3. Analyze the operation of semiconductor special purpose diodes.
   a. Analyze and demonstrate the operation of Zeener diode circuit.
   b. Analyze and demonstrate the operation of light emitting diode circuit.
   c. Explain the characteristics of Schottley diodes.
   d. Explain the characteristics of varactor diodes.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
4. Analyze the operation of bipolar junction transistors.
   a. Define and identify transistor voltages and currents.
   b. Analyze and demonstrate the operation of a DC common emitter circuit.

c. Demonstrate the use of collector curves to represent out circuit parameter.
d. Demonstrate the use of load lines.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP3, WP4

5. Explain and demonstrate the biasing of a transistor.
   a. Analyze and demonstrate base bias.
   b. Analyze and demonstrate emitter bias.
   c. Analyze and demonstrate voltage divider bias.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4, WP5
6. Explain and analyze the construction of BJT amplifiers.
   a. Analyze and discuss the basic operation of a common emitter voltage amplifier.
   b. Given a common emitter amplifier circuit, draw the AC equivalent circuit and solve for Vin, Vout, and A.
   c. Explain how the swamped common emitter amplifier works and discuss its advantages.
   d. Given a swamped common emitter amplifier circuit, draw the AC equivalent circuit and solve for Zin, Vin, Vout, A.
   e. Construct common emitter amplifiers and compare measured parameters to calculated values.
   f. Given a cascaded common emitter amplifiers calculate gain of stage one, gain of stage two, and output voltage.
   g. Given a power amplifier circuit, solve for the maximum generator voltage that will produce an unclipped output signal and solve the maximum efficiency of the amplifier.
   h. Given a emitter-follower circuit solve for Zin, Vin, A, Vout.
   i. Describe the characteristics of a class A power amplifier to include the factors which limits the power rating of a transistor.
   j. Construct class A and class B amplifiers and troubleshoot the circuits.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
7. Analyze the operation of field effect transistors and demonstrate their applications.
   a. Describe the basic construction of a JFET.
   b. Calculate the proportional pinchoff voltage and determine the operating area of a JFET.
   c. Given a JFET circuit determine ID and Vds.
   d. Given a JFET amplifier circuit, draw the AC equivalent circuit and solve for gmo, gm, Zin, Vin, A, Vout.
   e. Given a JFET source follower circuit, with a given gm, solve for Vin, A, Vout.

f. Illustrate the construction of and describe the operation of the depletion-mode and the enhancement-mode MOSFET.
g. Analyze other FET applications, such as multiplying, switching, chopper, AGC, and sample and hold amplifier.

Related Academic Topics (See Appendix A): C5, C6, M1, M3
Workplace Skills (See Appendix B): WP5, WP6

8. Analyze the operation of thyristors and demonstrate their applications.
   a. Describe the four-layer diode and discuss how it is turned on and off.
   b. Describe how the SCR operates in different applications.
   c. Construct a latching SCR with a varying input voltage, determine when the output voltage is latched.
   d. Describe the main characteristics of the variations of the SCR and discuss the difference in device symbols.
   e. Describe the characteristics of the diac and triac.
   f. Calculate the intrinsic standoff voltage for a unijunction transistor (UJT) and state how it works.
   g. Analyze Thyristor applications, such as over voltage detector, sawtooth generator, SCR crowbar, and controlled SCR circuits phase angle controlled circuits.
   h. Construct thyristors circuits and vary the latching parameters, measure the output to view switching and control of the device.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP6

Course Name: Microprocessors

Course Abbreviation: EET 1324

Classification: Vocational-Technical Core (Communications Electronics Repair Technology, Computer Servicing Technology, Electronics Technology), Vocational-Technical Elective (Automated Manufacturing Technology, Robotics Technology)

Description: This course is designed to provide students with skills and knowledge of microprocessor architecture, machine and assembly language, timing, interfacing, and other hardware applications associated with microprocessor systems. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Digital Electronics (EET 1214)

Competencies and Suggested Objectives:

1. Demonstrate an understanding of microprocessor structure and terminology.
   a. Define microprocessor terms.
   b. Name the basic blocks of a microprocessor and explain the function of each block.
   c. Explain the blocks of a microprocessor.
   d. Explain the external bus structure of a microprocessor.
   e. Interpret manufacturers' specifications to determine package type and pinout of a microprocessor.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP3
2. Analyze the architectural design of microprocessors.
   a. Describe the features of single bus, double bus, and triple bus microprocess or architecture.
   b. Differentiate between the internal bus standards.
   c. Explain the function of a general purpose interface adaptor IC.
   d. Explain the function of a programmable peripheral interface IC.
   e. Label a block diagram of the components of a typical microprocessor IC.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
3. Describe the use of instruction sets and machine codes in operating microprocessors.
   a. Differentiate between machine language and assembly language.
   b. Show how a mnemonics is related to a microprocessor instruction.
   c. List the four fields in an assembly language program.
   d. Recognize the difference between source and object code.
   e. Explain how a microprocessor handles an instruction.
   f. Follow the instruction cycle of a typical command.

g. Recognize the basic addressing modes used in microprocessor programming.
h. Explain the three distinct phases of operation of an instruction cycle to include fetching, decoding and executing.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP3, WP4

4. Understand principles and operation of types of microprocessor memory circuits.
   a. Explain the three basic elements of memory to include storage area, input and output access capability.
   b. Explain the terms volatile and non-volatile memory.
   c. Describe and demonstrate the read and write operations of memory.
   d. Explain the function of ROM.
   e. Explain the function of RAM.
   f. Explain how a memory matrix is organized.
   g. State the difference between static and dynamic RAM.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP5

5. Develop, execute, and debug microprocessor programs in assembly language.
   a. Explain how a microprocessor performs arithmetic operations.
   b. Write a machine language program to perform a simple arithmetic computation and demonstrate that the program runs.
   c. Give an example of a situation in which a loop program is needed.
   d. Explain the function of the status register.
   e. Write a machine language program to perform a loop operation and demonstrate that the program runs.
   f. Define the term subroutine.
   g. Give an example of a situation in which an interrupt program is needed and state the advantages of having interrupt capabilities.
   h. Define the stack pointer.
   i. Discuss interrupt priority.
   j. Write a machine language program to detect an interrupt and demonstrate that the program runs.

   Related Academic Topics (See Appendix A): C5, C6, M1
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Computer Fundamentals for Electronics/Electricity

Course Abbreviation: EET 1613

Classification: Vocational-Technical Elective (Automated Manufacturing Technology, Communications Electronics Repair Technology, Computer Servicing Technology, Electronics Technology, Instrumentation Technology, Robotics Technology, Electrical Technology)

Description: This course introduces the student to basic computer science as used in electricity/electronics areas. Computer nomenclature, logic, numbering systems, coding, operating system commands, editing, and batch files are covered. (This course may be substituted for Introduction to Computers. [CPT 1114]) (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Demonstrate the essentials of microcomputer components.
   a. Describe the types and functions of power supplies.
   b. Demonstrate the use of motherboard/UP and computer environment.
   c. Describe the types and use of floppy disc drives.
   d. Discuss the uses of motherboard memory/numbering systems-Kilo and Meg.
   e. Define motherboard expansion slots.
   f. Demonstrate the power on self test.
   g. Demonstrate motherboard replacement and set-up.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
2. Demonstrate an understanding of essential microcomputer peripherals.
   a. Describe KYBD-input data.
   b. Demonstrate the use of the mouse.
   c. Describe the procedures for the operation of the printer.
   d. Prepare a modem and make a call to an outside phone.
   e. Write and read to and from a hard drive.
   f. Write and read to and from a floppy drive.
   g. Connect video monitors and adapters.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Demonstrate an understanding of essential microcomputer operating systems.
   a. Define DOS and its application.
   b. Operate a PC using DOS commands.

c. Explain DOS files, files management, disk management, line editor, utilities, and technical aspects.
d. Demonstrate how to make revisions using DOS utilities.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5, WP6

4. Demonstrate an understanding of essential microcomputer architecture.
   a. Define microcomputer architecture.
   b. Identify major differences of:
      (1) Work length.
      (2) Size of directly addressable memory.
      (3) Micro-processor speed.
   c. Draw and label a block diagram of a typical architecture indicating all major components.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP6

5. Create a batch file.
   a. Create a batch file to clean screen and:
      (1) Display messages.
      (2) Display current directory.
      (3) Display the contents of a user selected directory.
      (4) Direct a file to a printer.
   b. Create on auto-exec.BAT to clear screen and:
      (1) Display a message.
      (2) Change DOS prompt to display wither date or current history.
      (3) Call batch file created in step 1.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5, WP6

6. Use editing, debugging techniques.
   a. Debug a faulty batch file.
   b. Edit a faulty batch file.
   c. Debug a faulty AUTO EXEC batch file.
   d. Edit a faulty AUTO EXEC batch file.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5, WP6

7. Set up and configure a microcomputer using operating system.
   a. Set up a DOS path for three sub-directories.
   b. Develop a configuration system file which creates a selected number of buffers and files assigned.
   c. Create a RAM drive (Virtual disk).
   d. Generate two sub-directories in the RAM drive and transfer the two files from a floppy drive to the RAM drive.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5

8. Demonstrate competency with a graphic operating system.
   a. Complete the following tasks using a windows driven operating system:
      (1) Format a disk.
      (2) Save files to disk.
      (3) Read files to disk.
      (4) Change colors of window borders.
      (5) Install a program and assign an icon.
      (6) Perform word processing using a windows driven word processor.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP6

Course Name: Drafting for Electronic/Electrical Technology

Course Abbreviation: EET 1713

Classification: Vocational-Technical Elective (Communications Electronics Repair Technology, Computer Servicing Technology, Electrical Technology, Electronics Technology, Instrumentation Technology, Telecommunications Technology)

Description: This course is designed to provide instruction on the preparation and interpretation of schematics. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Demonstrate an understanding of drafting fundamentals using block, flow and single line diagrams.
   a. Explain the need for drawing quality and standard drawing sizes.
   b. Identify drafting tools.
   c. Explain the requirements for lettering and different line widths.
   d. Create an orthographic drawing.
   e. Discuss computer aided design (CAD).

   Related Academic Topics (See Appendix A): C5, C6, M5
   Workplace Skills (See Appendix B): WP2, WP3
2. Demonstrate an understanding of electronic symbols, components, and references used in schematic and logic diagrams.
   a. Identify components by symbol.
   b. Correctly draw component and competent symbols to drafting standards.
   c. Correctly reference components.
   d. Correctly write component values.
   e. Use symbols in schematic circuits.
   f. Work from an engineer sketch.
   g. Draw a logic diagram and interpret logic symbols.
   h. Draft a point-to-point diagram.
   i. Draft a pictorial point-to-point diagram.
   j. Draw an interconnection diagram.
   k. Draw a cable assembly.

   Related Academic Topics (See Appendix A): M4, M5
   Workplace Skills (See Appendix B): WP2, WP3
3. Demonstrate an understanding of printed circuitry and packaging drawings.
   a. Create a printed board assembly.
   b. Apply rules of good dimensioning to mechanical drawing.
   c. Define and make axonometric, isometric, and oblique projections.

Related Academic Topics (See Appendix A): M4, M5
Workplace Skills (See Appendix B): WP2, WP3

4. Demonstrate an understanding of electronics drafting using CAD.
   a. Create electronic symbols.
   b. Insert symbols into a drawing.
   c. Use the stretch command to arrange a schematic.
   d. Draw schematics using CAD software.

   Related Academic Topics (See Appendix A): M4, M5
   Workplace Skills (See Appendix B): WP2, WP4

Course Name: Linear Integrated Circuits

Course Abbreviation: EET 2334

Classification: Vocational-Technical Core (Computer Servicing Technology, Communications Electronics Repair Technology, Electronics Technology, Robotics Technology); Vocational-Technical Elective (Instrumentation Technology, Telecommunications Technology)

Description: This course is designed to provide the student with skills and knowledge associated with advanced semiconductor devices and linear integrated circuits. Emphasis is placed on linear integrated circuits used with operational amplifiers, active filters, voltage regulators, timers, and phase-locked loops. (4 sch: 3 hr. lecture, 2 hr. lab)

Prerequisites: Solid State Devices and Circuits (EET 1314)

Competencies and Suggested Objectives:

1. Analyze and demonstrate the effects of frequency on amplifiers.
   a. Define what is meant by frequency response.
   b. Determine the input and output capacitances of an amplifier.
   c. Discuss the characteristics of the frequency response of an amplifier.
   d. Identify the critical frequencies in the response of an amplifier.
   e. Analyze the effects of coupling and bypass capacitors at low frequency.
   f. Relate the upper limit of the frequency response at high frequencies to the internal capacitances of the amplifier's transistors.
   g. Define midrange gain of an amplifier.
   h. Define the term roll off and explain what factors determine it.
   i. Compare direct-coupled and capacitively-coupled amplifiers in terms of their low frequency response.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
2. Describe the principles, operation, and characteristics of operational amplifier.
   a. Explain the operation of a basic differential amplifier
   b. Use a circuit diagram to fabricate a differential amplifier and demonstrate its use in at least the following three modes: single ended input, differential input, common mode input.
   c. Draw and label the schematic symbol of the basic operational amplifier (op-amp).
   d. Compare the ideal op-amp characteristics with the practical op-amp characteristics.
   e. Interpret manufacturers' specifications, including package type, pinouts, input offset voltage, input bias current, input impedance, input offset

current, output impedance, common made range, open loop voltage gain, CMRR, and slew rate.

f. Discuss positive and negative feedback and how it is used in amplifiers.
g. Distinguish between the open-loop voltage gain and closed-loop voltage gain of an op-amp.
h. Define stability and discuss the factors which affect the stability of an op-amp.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP3, WP4

3. Describe and demonstrate the function and operational characteristics of op-amps in linear applications.
   a. Recognize and analyze inverting, non-inverting, and voltage follower op-amp configurations.
   b. Construct, troubleshoot, and demonstrate a circuit using an op-amp as an inverting, a non-inverting, and a voltage follower amplifier using the appropriate components with a circuit diagram.
   c. Define frequency response as it relates to op-amps.
   d. Describe the frequency response characteristics of the op-amp in various applications.
   e. Explain the function of each of the following circuits: summing amplifier, instrumentation amplifier, averaging amplifier, scaling amplifier.
   f. Recognize an op-amp configured to operate in each of the circuits in Objective 3-e.
   g. Use a circuit diagram to fabricate, troubleshoot, and demonstrate each of the circuits in Objective 3-e with the use of an op-amp.
   h. Explain the function of each of the following filters: low pass, high pass, band-pass and band-stop.
   i. Recognize an op-amp configured to operate in each of the filters in Objective 3-h.
   j. Use a circuit diagram to construct, troubleshoot, and demonstrate the use of an op-amp in each of the filters in Objective 3-h.

   Related Academic Topics (See Appendix A): C5, C6, M2
   Workplace Skills (See Appendix B): WP4, WP5, WP6

4. Describe and demonstrate the function and operational characteristics of op-amp in non-linear applications.
   a. Explain the function of the following circuits: zero level detection comparator, non-zero level detection comparator, integrator, differentiator.
   b. Recognize an op-amp configured to operate in each of the circuits in Objective 4-a.
   c. Use a circuit diagram to fabricate, troubleshoot, and demonstrate each of the circuits in Objective 4-a using an op-amp.
   d. Explain the function of a Schmitt trigger.
   e. Illustrate the use of a 555 as an oscillator.

f. Explain the function of an oscillator.
g. Recognize an op-amp configured to operate in each of the following types of oscillators: Wien-bridge, phase-shift, twin-T, Colpitts, Clapp, Hartley, Armstrong.
h. List the conditions required to sustain oscillation in a circuit.
i. Use appropriate formulas to calculate resonant frequency of each of the oscillators in Objective 4-g.
j. Use a circuit diagram and an op-amp with appropriate components to fabricate, troubleshoot, and demonstrate each of the oscillators in Objective 4-g.
k. Recognize the use of a quart crystal in an oscillator circuit.
l. Recognize and explain the use of an op-amp in a non-sinusoidal oscillator.
m. Recognize and explain the use of an op-amp in a voltage-controlled oscillators.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP4, WP5, WP6

5. Describe the function and operating characteristics of voltage regulators.
   a. Explain the basic concept of voltage regulation.
   b. Differentiate between line and load regulation.
   c. Recognize a basic series voltage regulator circuit and describe the circuits operating characteristics.
   d. Recognize a basic short voltage regulator circuit and describe the circuits operating characteristics.
   e. Differentiate between linear and switching voltage regulators.
   f. Recognizé typical IC linear and switching regulators.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP5

Course Name: Electronic Communications

Course Abbreviation: EET 2414

Classification: Vocational-Technical Core (Communications Electronics Repair Technology, Electronics Technology); Vocational-Technical Elective (Telecommunications Technology, Automated Manufacturing Technology)

Description: This course is designed to provide the student with concepts and skills related to analog and digital communications. Topics covered include amplitude and frequency modulation, transmission, and reception, data transmission formats and codes, the RS-232 interface, and modulation-demodulation of digital communications. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Solid State Devices and Circuits (EET 1314)

Competencies and Suggested Objectives:

1. Explain the operation of the components of a communication system.
   a. Explain and demonstrate the operation of RF amplifiers.
   b. Explain and demonstrate the operation of RF oscillators.
   c. Explain and demonstrate the operation of RF filters.
   d. Explain and demonstrate the operation of RF mixers.
   e. Explain and demonstrate the operation of phase locked loop.
   f. Demonstrate how these components are used together to implement a receiver and a transmitter.

   Related Academic Topics (See Appendix A): C5, C6, S8
   Workplace Skills (See Appendix B): WP1, WP4
2. Explain and perform signal and noise analysis.
   a. Convert between dB and voltage ratios, and between dB and power ratios.
   b. Use dB and dBm to gains and power levels of cascaded system.
   c. Explain electrical noise and noise figures and calculate noise figures for cascaded systems.
   d. Explain and calculate noise floor and signal to noise ratio for components and systems.
   e. Explain and use power spectrum to represent RF signals.

   Related Academic Topics (See Appendix A): C5, C6, S8, M1
   Workplace Skills (See Appendix B): WP4
3. Analyze and demonstrate the characteristics and operation of AM systems.
   a. Describe and graph AM signals in time and frequency domains.
   b. Explain and calculate modulation index for AM.
   c. Explain AM generation and detection.
   d. Analyze and demonstrate an AM transmitter receiver link.

e. Describe and graph AM SSB signals in time and frequency domains.
f. Explain AM SSB generation and detection.
g. Analyze and demonstrate an AM SSB transmitter/receiver link.

Related Academic Topics (See Appendix A): C5, C6, S8, M1, M5
Workplace Skills (See Appendix B): WP4, WP5

4. Analyze and demonstrate the characteristics and operation of FM systems.
   a. Describe and graph FM signals in time and frequency of domains.
   b. Explain and calculate modulation, index for FM.
   c. Explain FM generation and detection.
   d. Explain stereo FM systems.
   e. Analyze and demonstrate a FM transmitter/receiver link.

   Related Academic Topics (See Appendix A): C5, C6, M1, M5
   Workplace Skills (See Appendix B): WP5, WP6
5. Analyze and demonstrate the characteristics and operation of Digital Modulation.
   a. Analyze and explain pulse modulation systems.
   b. Analyze and explain frequency shift keying systems.
   c. Analyze and explain phase shift keying systems to include BPSK, QPSK and higher orders.
   d. Analyze and explain quadrature amplitude modulation systems to include higher orders.
   e. Analyze and explain error correcting codes.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
6. Analyze and explain the characteristics of wave propagation, antennas, and transmission lines.
   a. Explain the characteristics of a transmission line and represent by equivalent circuit.
   b. Explain wave propagation through T lines to include reflections and standing waves.
   c. Analyze and demonstrate electromagnetic wave propagation.
   d. Analyze and explain the characteristics of various types of antennas.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
7. Analyze and explain one-way and two-way communication.
   a. Describe and differentiate between simplex, half duplex, and full duplex communication.
   b. Demonstrate various two-way communications systems.
   c. Describe the operation of a wire line telephone systems.
   d. Describe the operation of a cellular telephone systems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Fundamentals of Fiber Optics

Course Abbreviation: EET 2423

Classification: Vocational-Technical Core (Telecommunications Technology); Vocational-Technical Elective (Communications Electronics Repair Technology, Electronics Technology, Electrical Technology, Instrumentation Technology)

Description: This course is designed to provide skills and knowledge concerning the use of fiber optic cable in modern industry applications. (3 sch: 2 hr. lecture, 2 hr. lab)

Pre/Corequisites: Electronic Communications (EET 2414)

Competencies and Suggested Objectives:

1. Describe history and advantages of fiber optic systems.
   a. Describe the limitations of wire communications systems.
   b. Describe the technical developments making optical.
   c. Fiber communications feasible.
   d. List the advantages of optical fiber communications over electrical wire communications.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2
2. Explain the operational and application of optical signal sources.
   a. Explain the advantages and disadvantages of LEDs as optical signal sources.
   b. Describe the principle of operation of semiconductor lasers.
   c. Explain the advantages and disadvantages of lasers as optical signal sources.
   d. Explain the operation of modulator circuits for optical signal sources.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
3. Explain the operation and application of fiber optic system components.
   a. Describe the construction of optical fibers.
   b. Explain optical fiber cable specifications.
   c. Describe the operation of detectors used in fiber optic systems.
   d. Explain the operating principle and purpose of transceivers and repeaters.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP3
4. Explain the theory of light propagation in vacuum and in optical fiber.
   a. Explain the modes of optical fiber light transmission.
   b. Describe the light loss mechanisms which occur in optical fibers.
   c. Describe the use of Snell's Law as it relates to fiber optics.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP2, WP3

5. Describe properties of different types of optical fibers.
   a. Differentiate between the properties and characteristics of plastic and glass optical fibers.
   b. Describe the effect of core size on efficiency and bandwidth.
   c. Describe fiber optical cables available for indoor and outdoor installation.
   d. Prepare and complete a splice of fiber optic cable following industry standards and safety procedures.
   e. Describe requirements for certification as a fiber optic technician.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP3

Course Name: Interfacing Techniques

Course Abbreviation: EET 2514

Classification: Vocational-Technical Core (Computer Servicing Technology, Electronics Technology); Vocational-Technical Elective (Automated Manufacturing Technology, Communications Electronics Repair Technology, Robotics Technology)

Description: This course is a study of data acquisition devices and systems including their interface to microprocessors and other control systems. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Microprocessors (EET 1324)

Competencies and Suggested Objectives:

1. Describe Industry Standards for Interfacing.
   a. Explain the application of an RS232 interface as associated with interfacing.
   b. Explain the application of an GPIB interface as associated with interfacing.
   c. Explain the application of an HPIB interface as associated with interfacing.
   d. Explain the application of an IEEE488 interface as associated with interfacing.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP3
2. Identify signals related to parallel and serial ports.
   a. Recognize that RS232 is a serial port standard.
   b. In RS232, relate "Data Terminal Ready" to DTR.
   c. In RS232, relate "Data Terminal Ready" to DSR.
   d. In RS232, relate "Request to Send" to RTS.
   e. In RS232, relate "Clear to Send" to CTS.
   f. In RS232, relate "Carrier Detected" to CD.
   g. Recognize that GPIP, HPIB, IEEE488 are parallel port standards.
   h. In any parallel port standard, relate each of the following terms to the appropriate signal:
      Interface Clear IFC
      Attention ATN
      Service Request SRQ
      Remote Enable REN
      End or Identify EOI
      Data Valid DAV
      Not Ready for Data DAV
      No Data Accepted NDAC

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP2, WP4

3. Describe interfacing requirements of computer peripherals.
   a. Explain the purpose, capabilities, fundamental operation, and interfacing requirements of monitors.
   b. Explain the purpose, capabilities, fundamental operation, and interfacing requirements of printer.
   c. Explain the purpose, capabilities, fundamental operation, and interfacing requirements of keyboard.
   d. Explain the purpose, capabilities, fundamental operation, and interfacing requirements of disk drive.
   e. Explain the purpose, capabilities, fundamental operation, and interfacing requirements of CD ROM.
   f. Explain the purpose, capabilities, fundamental operation, and interfacing requirements of mouse.
   g. Explain the purpose, capabilities, fundamental operation, and interfacing requirements of modem.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
4. Describe special purpose large scale integration devices.
   a. Explain operation and application of CRTC.
   b. Explain operation and application of keyboard encodes.
   c. Explain operation and application of PIA and PPI peripheral interfaces.
   d. Explain operation and application of UARTs and USARTs.
   e. Explain operation and application of disk formatters and controllers.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4
5. Explain and demonstrate methods for converting physical variables.
   a. Describe and demonstrate the operation and interfacing of common light sensors.
   b. Describe and demonstrate the operation and interfacing of temperature sensors (RTD).
   c. Describe and demonstrate the operation and interfacing of strain gages.
   d. Describe and demonstrate the operation and interfacing of flow sensors.
   e. Describe and demonstrate the operation and interfacing of 4-20ma current loops.
   f. Describe and demonstrate the operation and interfacing of Opto-Isolators.
   g. Describe and demonstrate the operation and interfacing of Digital to Analog Converters.
   h. Describe and demonstrate the operation and interfacing of Analog to Digital Converters.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP4

6. Use microprocessor to evaluate data as a result of physical variables taking place.
   a. Describe D/A operation and parameters (resolution, setting time, accuracy, linearity).
   b. Draw and connect circuits interfacing D/A with any number of bits to a microcomputer.
   c. Describe A/D operation and parameter.
   d. Draw and connect circuits interfacing A/D converters to a microcomputer.
   e. Write programs to support both above exercises.
   f. Describe how feedback is used in control loops.

   Related Academic Topics (See Appendix A): C5, C6, M7
   Workplace Skills (See Appendix B): WP2, WP4, WP6

Course Name: Video Systems

Course Abbreviation: EET 2813

Classification: Vocational-Technical Core (Communication Electronics Repair Technology), Vocational-Technical Elective (Computer Servicing Technology, Electronics)

Description: This course is a study of the circuits and systems used in the production, transmission, and reception of video information to include color systems and computer-video interfacing. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Solid State Devices and Circuits (EET 1314)

Competencies and Suggested Objectives:

1. Describe the process of television broadcasting fundamentals.
   a. Name and identify the signals transmitted by a TV station within 6-Mhz bandpass allocation.
   b. Explain frequency allocation for TV stations.
   c. Explain vestigial transmission.
   d. List channel allocations for UHF & VHF.
   e. Explain how colors are viewed by the camcra, CRT, & readied for transmission.
   f. Describe the functions of each stage of block diagram of a typical TV station.
   g. Explain how CRT is scanned to develop a raster.

   Related Academic Topics (See Appendix A): C5
   Workplace Skills (See Appendix B): WP2, WP5
2. Explain the basic function of a TV receiver.
   a. Draw the block diagram of a monochrome receiver.
   b. Briefly explain the function of each block of a monochrome receiver.
   c. Explain the function of use controls on a receiver.
   d. Explain how the picture is developed on CRT.
   e. Briefly explain how the correct colors are displayed on a picture.

   Related Academic Topics (See Appendix A): C5
   Workplace Skills (See Appendix B): WP2, WP3
3. Describe and demonstrate safety hazards of working with video systems.
   a. List hazards of working with handling picture tube.
   b. List hazards of working with high voltage.
   c. List hazards of working "Hot" Chass.
   d. Explain what is meant by the term "Hot" Chass.

e. State the purpose of using an isolation transformer.
f. Explain the purpose and method of discharging a CRT.

Related Academic Topics (See Appendix A): C5
Workplace Skills (See Appendix B): WP3, WP6

4. Analyze the functions of each block in a color TV receiver.
   a. Explain what a scan derived power supply is.
   b. Explain the need for voltage regulation.
   c. Analyze and troubleshoot low voltage and height voltage power supply.
   d. Explain the basic operation of the vertical deflection circuits.
   e. Analyze the vertical deflection portion of a receiver.
   f. Explain the purposes of horizontal sweep generators.
   g. Analyze the horizontal sweep section of a TV receiver.
   h. Explain the purpose of sync separation.
   i. Describe the purpose of the tuner section of a receiver.
   j. List troubleshooting procedures.
   k. Explain the operation of the video IF detector and AGC circuitry.
   l. Explain the chromo signal processing.
   m. Explain the operations of the CRT.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

5. Explain the principles of computer logic applied to TV for producing special effects.
   a. Explain why picture resolution is limited by 6 MHz.
   b. Explain double scanning, its purpose, and how it is accomplished.
   c. Explain several methods presently used to enhance picture quality.
   d. Explain how special effects are dependent on digital technology.
   e. List special effects provided by most high quality TV sets.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

6. Analyze the fundamental operations of a video display system.
   a. Explain picture quality and resolution.
   b. Explain the difference between vertical and horizontal resolution.
   c. Explain why a com b filter contributes to good picture quality.
   d. Explain why a video monitor provides a sharpen image than is possible with most TV sets.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

7. Analyze the operation of a video generating system.
   a. Describe how images are converted into electrical pulses/
   b. Explain purpose of synchronization between camera pulses on receiver pulses.
   c. Explain how color is viewed by the camera CRTs
   d. Describe vestigial transmission.
   e. Explain the purpose of the color subcarrier.

f. Explain why the signal is produced.
g. Explain why the color green is not transmitted.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5, WP6

8. Analyze the operation of a video storage system.
   a. Explain briefly how signals are recorded onto tape than recovered during playback.
   b. Draw the block diagram of a VCR.
   c. Explain helical scanning.
   d. Explain how video tracks are recorded.
   e. Explain the advantages of four head over two.
   f. State functions performed by 30 Hz reference signal.
   g. Explain servo control for record & playback.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Special Project

Course Abbreviation: EET 291(1-3)

Classification: Vocational-Technical Elective (Electronics Technology)

Description: This course is designed to provide the student with practical application of skills and knowledge gained in other electronics or electronics-related technical courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Develop a written plan which details the activities and projects to be completed.
   a. Utilize a written plan which details the activities and projects to be completed.
   b. Perform written occupational objectives in the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
2. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Utilize a set of written guidelines for the special project.
   a. Develop and follow a set of written guidelines for the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6

Course Name: Supervised Work Experience

Course Abbreviation: EET 292(1-6)

Classification: Vocational-Technical Elective (Electronics Technology)

Description: This course is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in electrical/electronics related programs

Competencies and Suggested Objectives:

1. Apply technical skills needed to be a viable member of the work force.
   a. Prepare a description of technical skills to be developed in the supervised work experience program.
   b. Develop technical skills needed to be a viable member of the work force.

   Related Academic Topics (See Appendix A): C4, C5
   Workplace Skills (See Appendix B): WP1
2. Apply skills developed in other program area courses.
   a. Perform skills developed in other program area courses in the supervised work experience program.

   Related Academic Topics (See Appendix A): C4, C5
   Workplace Skills (See Appendix B): WP6
3. Apply human relationship skills.
   a. Practice human relationship skills in the supervised work experience program.

   Related Academic Topics (See Appendix A): C6
   Workplace Skills (See Appendix B): WP3
4. Apply and practice positive work habits and responsibilities.
   a. Perform assignments to develop positive work habits and responsibilities.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
5. Work with instructor and employer to develop written occupational objectives to be accomplished.
   a. Perform written occupational objectives in the supervised occupational experience program.

   Related Academic Topics (See Appendix A): C5
   Workplace Skills (See Appendix B): WP6

6. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5
   Workplace Skills (See Appendix B): WP6
7. Utilize a set of written guidelines for the Supervised Work Experience.
   a. Develop and follow a set of written guidelines for the Supervised Work Experience.

   Related Academic Topics (See Appendix A): C5
   Workplace Skills (See Appendix B): WP6

INSTRUMENTATION TECHNOLOGY COURSES

Course Name: Fundamentals of Instrumentation

Course Abbreviation: INT 1113

Classification: Vocational-Technical Elective (Instrumentation Technology)

Description: This course provides students with a general knowledge of instrumentation principles. This course includes instruction in the basis of hydraulics and pneumatics and the use of electrical circuits in the instrumentation process. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Demonstrate a working knowledge of instrumentation.
   a. Define terms associated with instrumentation.
   b. Discuss basic theory of hydraulics, pneumatics, and electro-magnetic controls.
   c. Identify basic symbols used with hydraulics, pneumatics, and electro-magnetic systems.

   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
2. Identify the type of instrumentation input and output devices and describe their applications.
   a. Describe controls elements for pressure, flow, temperature, and level.
   b. Identify the types of input and output devices.
   c. Describe the input and output devices.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
3. Identify the types of signals used in instrumentation.
   a. Describe the transmission of information to include current, pressure, and frequency.
   b. Explain the principles of the transmission information input and output.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
4. Describe fundamentals of process controls.
   a. Label a block diagram of an open loop system and closed loop system.
   b. Describe characteristics of an open loop and closed loop systems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP5

5. Design a preventative maintenance program for instrumentation systems.
   a. Describe the techniques and procedures for troubleshooting, calibrating, and repairing an instrumentation system.
   b. Demonstrate the ability to sketch a piping and instrument drawing.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Fluid Power

Course Abbreviation: INT 1214

Classification: Vocational-Technical Core (Instrumentation Technology, Automated Manufacturing Technology), Vocational-Technical Elective (Electronics Technology, Robotics Technology)

Description: This basic course provides instruction in hydraulics and pneumatics. The course covers actuators, accumulators, valves, pumps, motors, coolers, compression of air, control devices and circuit diagrams. Emphasis is placed on the development of control circuits and troubleshooting techniques. (4 sch: 3 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Define and describe basic laws governing fluids.
   a. Describe the concept of force, flow, and pressure.
   b. Analyze the relationship of force and pressure in a circuit.
   c. Explain what causes flow in a circuit.
   d. Calculate area, pressure, velocity, and rate of flow.
   e. Explain and apply Charles' Law in pneumatics.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP4
2. Identify and draw symbols for hydraulics and pneumatics.
   a. Explain the logic for drawing symbols for hydraulics components.
   b. Draw individual hydraulic and pneumatic components.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
3. Describe operation and nomenclature of various pumps and compressors.
   a. Analyze the operation of vane, gear, and piston pumps in hydraulics.
   b. Analyze the operation of air compressors.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
4. Explain fluids as pertaining to the transmission of energy.
   a. Describe various types of hydraulic fluids.
   b. Explain the purpose of the fluid reservoir, filtration system, and the heat exchanger in hydraulics.
   c. Explain the purpose of the receiver in pneumatics.
   d. Explain the purpose of trio units in compressed air.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4

5. Describe the operation of flow, pressure, and directional control valves.
   a. Explain basic design features used in each type of control valve.
   b. Demonstrate how flow, pressure, and directional valves are used in hydraulics and pneumatics.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
6. Explain the types of actuators used in pneumatics and hydraulics.
   a. List important cylinder design features.
   b. Explain basic design features of hydraulic motors and other rotary actuators.
   c. Identify common types of air motors.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
7. Explain, construct, and troubleshoot various hydraulic and pneumatic circuits.
   a. Explain the purpose of a sequence circuit.
   b. Construct and troubleshoot a sequence circuit.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
8. Demonstrate the use of electro-mechanical controls in hydraulic and pneumatic circuits.
   a. Explain the construction and use of solenoids in directional controls.
   b. Construct a hydraulic or pneumatic circuit that is controlled electrically.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Control Systems I

Course Abbreviation: INT 2114

Classification: Vocational-Technical Core (Instrumentation Technology); Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This is an introductory course to provide information on various instrumentation components and processes. Topics include analyzing pressure processes, temperatures, flow, and level. (4 sch: 3 hr. lecture, 2 hr. lab)

Prerequisites: AC Circuits (EET 1123)

Competencies and Suggested Objectives:

1. Explain and apply basic safety regulations which must be followed.
   a. Discuss required safety regulations for the lab and industrial settings.
   b. Discuss and apply safe working habits.
   Related Academic Topics (See Appendix A): C1, C3
   Workplace Skills (See Appendix B): WP1, WP3
2. Describe and discuss temperature measurement devices.
   a. Discuss heat transfer.
   b. Discuss temperature measurement principles.
   c. Identify devices used to measure and control temperature.
   d. Analyze and calibrate signals from temperature measurement devices.
   Related Academic Topics (See Appendix A): C1, C3
   Workplace Skills (See Appendix B): WP1, WP3
3. Describe and discuss pressure measurement devices.
   a. Identify and describe a manometer and its use.
   b. Identify and describe pressure elements and their use.
   c. Identify and describe measuring devices and their use.
   d. Analyze and calibrate pressure measurement devices.
   Related Academic Topics (See Appendix A): C1, C3
   Workplace Skills (See Appendix B): WP5
4. Describe and discuss level measurement devices and their use.
   a. Identify and describe direct level measurement devices and their use.
   b. Identify and describe indirect level measurement devices and their use.
   c. Analyze and calibrate level measurement devices.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
5. Describe flow measurement devices and their use.
   a. Identify and describe flow rate meters.
   b. Identify and describe total flow meters.

c. Analyze and calibrate flow measurement devices.

Related Academic Topics (See Appendix A): C5, C6

Workplace Skills (See Appendix B): WP5

6. Describe senors used in process analysis.
   a. Discuss analyzers used in instrumentation.
   b. Describe and discuss analytical measurement fundamentals.
   c. Troubleshoot the various sensors.

   Related Academic Topics (See Appendix A): C5, C6

   Workplace Skills (See Appendix B): WP5, WP6
7. Describe information transmission pertaining to process control.
   a. Discuss and describe pneumatic transmission characteristics.
   b. Explain electrical transmission characteristics.
   c. Perform exercises to re-enforce process control concepts.
   d. Identify various devices utilized in data information transmission.

   Related Academic Topics (See Appendix A): C5, C6

   Workplace Skills (See Appendix B): WP5

Course Name: Control Systems II

Course Abbreviation: INT 2124

Classification: Vocational-Technical Core (Instrumentation Technology); Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This course is a continuation of Control Systems I with special emphasis on application of applied skills along with new skills to develop instrument process controls. The student will be given a process to develop the appropriate instruments, needed diagrams, utilizing various controlling processes and demonstrate loop troubleshooting techniques. (4 sch: 3 hr. lecture, 2 hr. lab.)

Prerequisites: Control Systems I (INT 2114)

Competencies and Suggested Objectives:

1. Identify and describe parameters and variables of an operational process control system.
   a. Discuss and explain terms associated with process control instrumentation.
   b. Explain how the terms relate to the controlled process and diagrams.
   c. Describe and demonstrate different control configurations, feed forward, and cascade.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3
2. Describe control valve characteristics.
   a. Explain and demonstrate fast-opening, equal-percentage, and proportional control valves.
   b. Explain control valve positioners.
   c. Discuss and demonstrate signal conversions techniques.
   d. Apply maintenance techniques involving control valves.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3
3. Describe various modes of process control.
   a. Discuss and demonstrate on-off control.
   b. Explain and describe proportional, integral, and derivate modes of operation.
   c. Describe and demonstrate methods for tuning different control modes.
   d. Describe characteristics of each mode of operation.

e. Connect, tune, operate, and troubleshoot various process control configurations.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP6

4. Describe advanced control methods.
   a. Explain a digital control system.
   b. Discuss different levels of digital control.
   c. Describe and explain the computer's role in process control.
   d. Develop sketches of various control systems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
5. Troubleshoot process control loops.
   a. Perform standard troubleshooting techniques on process control loops.
   b. Apply safe troubleshooting techniques.
   c. Demonstrate and explain integration of system drawings.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
6. Demonstrate procedures for handling, storing, and disposing of hazardous materials.
   a. Recognize signal words and symbols that indicate severity of a hazard.
   b. Describe methods for reducing hazardous waste.
   c. Describe procedures for storing hazardous waste.
   d. Interpret data found on a hazardous material safety data sheet.
   e. Describe general safe procedures for first aid and clean-up to follow in case of an accident involving hazardous materials.
   f. Demonstrate procedures for handling, storing, and disposing of hazardous materials.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Calibration and Measurement Principles

Course Abbreviation: INT 2214

Classification: Vocational-Technical Core (Instrumentation Technology); Vocational-Technical Elective (Automated Manufacturing Technology)

Description: This course introduces the student to various terms related to measurement principles and calibration techniques. The topics also include the procedures and calibration of various instruments used in the industry. (4 sch: 3 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Define terms associated with measurement and calibration procedures.
   a. Describe traceability of a standard.
   b. Describe and explain static and dynamic characteristics of an instrument.
   c. Explain elevated and suppressed zero.
   d. Discuss instrument drift.
   e. Discuss units of measurement pertaining to instrumentation.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
2. Describe a standard calibration procedure.
   a. Develop a generic calibration procedure.
   b. Perform a calibration procedure on different instrumentation apparatus.
   c. Prepare a calibration report.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
3. Describe and perform specialized calibrations of differential pressure (DP) cells.
   a. Explain the procedures for calibrating a (DP) cell.
   b. Demonstrate wet leg, dry leg, pressurized vessel, elevated, and suppressed zero calibration.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
4. Describe and demonstrate Statistical Process Control (SPC).
   a. Perform basic operations of statistics.
   b. Explain statistics and the relationship to process control instrumentation.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

Course Name: Special Project

Course Abbreviation: INT 291(1-3)

Classification: Vocational-Technical Elective (Instrumentation Technology)

Description: This course is designed to provide the student with practical application of skills and knowledge gained in other electronics or electronics-related technical courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Develop a written plan which details the activities and projects to be completed.
   a. Utilize a written plan which details the activities and projects to be completed.
   b. Perform written occupational objectives in the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
2. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
3. Utilize a set of written guidelines for the special project.
   a. Develop and follow a set of written guidelines for the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6

Course Name: Supervised Work Experience

Course Abbreviation: INT 292(1-6)

Classification: Vocational-Technical Elective (Instrumentation Technology)

Description: This course is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in electrical/electronics related programs

Competencies and Suggested Objectives:

1. Apply technical skills needed to be a viable member of the work force.
   a. Prepare a description of technical skills to be developed in the supervised work experience program.
   b. Develop technical skills needed to be a viable member of the work force.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1
2. Apply skills developed in other program area courses.
   a. Perform skills developed in other program area courses in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Apply human relationship skills.
   a. Practice human relationship skills in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
4. Apply and practice positive work habits and responsibilities.
   a. Perform assignments to develop positive work habits and responsibilities.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
5. Work with instructor and employer to develop written occupational objectives to be accomplished.
   a. Perform written occupational objectives in the supervised occupational experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

6. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Utilize a set of written guidelines for the Supervised Work Experience.
   a. Develop and follow a set of written guidelines for the Supervised Work Experience.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

ROBOTICS TECHNOLOGY COURSES

Course Name: Fundamentals of Robotics

Course Abbreviation: ROT 1113

Classification: Vocational-Technical Core (Automated Manufacturing Technology, Robotics Technology); Vocational-Technical Elective (Electronics Technology, Instrumentation Technology)

Description: This course is designed to introduce the student to industrial robots. Topics to be covered include robotics history, industrial robot configurations, operation, and basic programming. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Describe the various major components of all robots.
   a. Explain the axes of movement.
   b. Label each major component.
   c. Identify four general types of work envelopes.
   d. Discuss three general forms of robot actuation.
   e. Identify different types of input devices used with robot controllers.
   f. Describe the characteristics of a robot which distinguishes it from other types of automated machinery.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2
2. Demonstrate safety procedures used in the automated environment.
   a. Apply safety rules for personal and general shop safety including eye, ear, and body protection; general rules of shop conduct; and the use of safety color coding.
   b. Apply general safety rules for tool and equipment use including hand tools, air and electric power tools, and other shop equipment
   c. Apply general safety rules associated with working on various robotics systems.
   d. Apply rules and procedures associated with fire safety including procedures for handling and storing flammable liquids and proper use of fire fighting devices.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2
3. Demonstrate the ability to operate robots.
   a. Evaluate robot performance.
   b. Apply basic programming skills.
   c. Identify and discuss end effectors.
   d. Identify and discuss visual and tactile sensors.

e. Demonstrate basic troubleshooting techniques.
Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP2, WP5

Course Name: Industrial Hydraulics

Course Abbreviation: ROT 1213

Classification: Vocational-Technical Core (Robotics Technology); Vocational-Technical Elective (Electronics Technology)

Description: This course introduces the students to basic hydraulics, hydraulic actuators, accumulators, valves, pumps, motors, fluids, coolers, and filters. Emphasis is placed on development of hydraulic control circuits and troubleshooting. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Define and describe basic laws governing liquids.
   a. Describe the concept of force, flow, and pressure.
   b. Analyze the relationship of force and pressure of a circuit.
   c. Explain what causes flow in a circuit.
   d. Calculate area, pressure, velocity, and rate of flow.
   e. Explain and apply Pascal's Law in hydraulics.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
2. Identify and draw symbols for hydraulics.
   a. Explain the logic for drawing symbols for hydraulic components.
   b. Draw individual hydraulic components.
   Related Academic Topics (See Appendix A): C1, C2
   Workplace Skills (See Appendix B): WP4, WP6
3. Describe operation and nomenclature of various pumps.
   a. Analyze the operation of vane, gear, and piston pumps.
   b. Describe the operation of centrifugal pumps.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP6
4. Explain liquids as pertaining to the transmission of energy.
   a. Describe various types of hydraulic fluid.
   b. Explain the purpose of the fluid reservoir, filtration system, and the heat exchange in hydraulics.
   c. Illustrate the relationship of viscosity, temperature, and resistance.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

5. Describe the operation of flow, pressure, and directional control valves.
   a. Explain basic design features used in each type of control valve.
   b. Demonstrate how flow, pressure, and directional valves are used.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
6. Explain the types of actuators used in hydraulics.
   a. List important cylinder design features.
   b. Explain basic design features of hydraulic motors and other rotary actuators.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Explain, construct, and troubleshoot various hydraulic circuits.
   a. Explain the purpose of a sequence circuit.
   b. Construct and troubleshoot a sequence circuit.
   c. Explain the purpose of a counterbalance circuit.
   d. Construct and troubleshoot a counterbalance circuit.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Industrial Pneumatics

Course Abbreviation: ROT 1223

Classification: Vocational-Technical Core (Robotics Technology); Vocational-Technical Elective (Electronics Technology)

Description: This course introduces the students to basic pneumatic principles, compression of air, work devices, control devices, and circuit diagrams. Emphasis is placed on development of pneumatic control circuits, electro-mechanical control of fluid power, and troubleshooting techniques. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Industrial Hydraulics (ROT 1213)

Competencies and Suggested Objectives:

1. Define and describe basic laws governing gases
   a. Describe the concept of force, flow, and pressure.
   b. Analyze the relationship of force and pressure on a circuit.
   c. Explain what causes flow in a circuit.
   d. Calculate area, pressure, velocity, and rate of flow.
   e. Explain and apply Charles' Law in pneumatics.
   f. Explain and verify Boyle's Law in a circuit.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
2. Identify and draw symbols for pneumatics.
   a. Explain the logic for drawing symbols for pneumatic components.
   b. Draw individual pneumatic components.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
3. Describe the operation and nomenclature of various compressors.
   a. Analyze the operation of vane and piston pumps in pneumatics.
   b. Analyze the operation of air compressors.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3, WP6
4. Explain fluids as pertaining to the transmission of energy.
   a. Explain the purpose of the receiver tanks, filtration system, and the heat exchanger.
   b. Describe the purpose of pressure drops in pneumatic systems.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
5. Describe the operation of flow, pressure, and directional control valves.
   a. Explain basic design features used in each type of control valve.

b. Demonstrate how flow, pressure, and directional valves are used in pneumatics.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP6

6. Explain the types of actuators used in pneumatics.
   a. List important cylinder design features.
   b. Explain basic design features of rotary actuators.
   c. Identify common types of air motors.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Explain, construct, and troubleshoot various pneumatic circuits.
   a. Explain the purpose of a sequence circuit.
   b. Construct and troubleshoot a sequence circuit.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
8. Demonstrate the use of electro-mechanical controls in hydraulic and pneumatic circuits.
   a. Explain the construction and use of solenoids in directional controls.
   b. Construct a pneumatic circuit that is controlled electrically.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Industrial Robotics

Course Abbreviation: ROT 1313

Classification: Vocational-Technical Core (Automated Manufacturing Technology, Robotics Technology); Vocational-Technical Elective (Instrumentation Technology)

Description: This course teaches the operating systems and advanced programming methods of industrial robots. Actual industrial grade robots are used to train the student in the areas of operation, maintenance, troubleshooting, service procedures, and robotics applications. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Fundamentals of Robotics (ROT 1113)

Competencies and Suggested Objectives:

1. Demonstrate an ability to integrate a robot into a process.
   a. Write programs on industrial robots to perform simulated industrial processes to operate within the confines of each robot's work envelope.
   b. Demonstrate the improvement of the efficiency of an automated robotics process by reducing cycle time, decreasing memory usage, using advanced programming techniques, etc.

   Related Academic Topics (See Appendix A): C1, C6
   Workplace Skills (See Appendix B): WP5
2. Demonstrate an ability to integrate peripheral equipment.
   a. Program and interface peripheral devices such as a programmable logic controller into robotics work cells.
   b. Interface contact and non-contact sensors into robotics work cell.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
3. Demonstrate an ability to troubleshoot and maintain a robotics workcell.
   a. Locate and isolate faults in robotics applications.
   b. Demonstrate the use of test equipment and troubleshooting logic to repair faults.
   c. Perform routine maintenance procedures on robots with the use of checklists and service equipment (Null servo valves, zero encoders, calibrate potentiometers, etc.).

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Automated Manufacturing Controls

Course Abbreviation: ROT 2413

Classification: Vocational-Technical Core (Robotics Technology)

Description: This course is designed to teach the students the integrated control systems found in automated systems. Emphasis will be placed on encoders, optical devices, servo motors, stepper motors, computerized numerical control (CNC), vision and sensing systems, lasers, programmatic controllers, motor speed controls, and other similar devices. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Industrial Robotics (ROT 1313)

Competencies and Suggested Objectives:

1. Demonstrate the ability to develop a robotics process.
   a. Plan a process.
   b. Design and lay out a process.
   Related Academic Topics (See Appendix A): C1, C5, C6
   Workplace Skills (See Appendix B): WP6
2. Demonstrate the ability to interface components of a robotics process.
   a. Integrate communication links between equipment.
   b. Integrate and maintain interlock of sequential operations.
   c. Utilize contact and non-contact sensors.
   d. Integrate peripheral equipment into the process.
   e. Integrate programmable controller into the process.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Demonstrate the ability to evaluate and troubleshoot a robotics process.
   a. Evaluate system performance.
   b. Apply problem solving logic.
   c. Read and interpret schematics.
   d. Explain and operate basic test equipment.
   e. Utilize diagnostic aids.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Servo Control Systems

Course Abbreviation: ROT 2423

Classification: Vocational-Technical Core (Robotics Technology)

Description: This course is designed to teach servo components, servo valves, velocity servos, positional servos, force, pressure, and torque servos, servo amplifiers, programmers, and servo analysis. Emphasis is placed on servo trim and maintenance and the applications of servo systems. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Linear Integrated Circuits (EET 2334) and Industrial Hydraulics (ROT 1213)

Competencies and Suggested Objectives:

1. Identify and discuss the components and characteristics of a servo system.
   a. Identify the components of a basic electro-hydraulic servo system.
   b. Identify servo valves as to control type and construction.
   c. Demonstrate operating characteristics of a servo valve by conducting performance tests.
   d. Explain servo valve construction, operation, and function.
   e. Identify the types of pilot stages for servo valves.
   f. Mechanically and/or electrically null a servo valve.
   g. Test a servo valve for flow gain, saturation, and linearity.
   h. Test a servo valve for pressure gain.
   i. Demonstrate how load pressure affects flow rate.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP5
2. Demonstrate the ability to construct and analyze open loop and closed loop systems.
   a. Draw a block diagram of a closed loop servo system.
   b. Identify and explain five control modes of a closed loop servo system.
   c. List and describe transducers commonly used with angular, linear, and velocity control systems.
   d. Construct and analyze open loop and closed loop velocity control systems.
   e. Construct and analyze open loop and closed loop angular position control systems.
   f. Construct and analyze open loop and closed loop linear position control systems.
   g. Demonstrate the concepts of accuracy, error, gain, response, and stability of closed loop servo systems.

h. Construct logic diagrams and flow charts for a servo control system.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP4, WP5

3. Demonstrate the ability to troubleshoot and repair a servo control system.
   a. Apply troubleshooting logic to solve electrical problems with a servo control system.
   b. Apply troubleshooting logic to locate and repair a fault in the hydraulic section of an electro-hydraulic servo control system.
   c. Construct and demonstrate an angular position control system as it relates to a simulated machine function.
   d. Construct and demonstrate velocity control as it relates to a simulated machine function.
   e. Construct and demonstrate linear position control as it relates to a simulated machine function.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5, WP6

Course Name: Mechanical Systems

Course Abbreviation: ROT 2613

Classification: Vocational-Technical Elective (Robotics Technology)

Description: This course introduces the students to mechanical components and drive systems commonly used in the industry. Emphasis is placed on installation, maintenance, and troubleshooting of these components and systems. (3 sch: 2 hr. lecture, 2 hr. lab)

Competencies and Suggested Objectives:

1. Describe the major components used in mechanical drive systems.
   a. Identify the mechanical components used in mechanical drive systems.
   b. Explain how individual mechanical components work.
   c. Name the parts of individual mechanical components.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP6
2. Apply the principles of installation, maintenance, and troubleshooting in mechanical drive systems.
   a. Install, maintain, and troubleshoot the mechanical components of a system.
   b. Apply preventive maintenance techniques to reduce equipment failure and prevent downtime.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Special Project

Course Abbreviation: ROT 291(1-3)

Classification: Vocational-Technical Elective (Robotics Technology)

Description: This course is designed to provide the student with practical application of skills and knowledge gained in other electronics or electronics-related technical courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Objectives:

1. Develop a written plan which details the activities and projects to be completed.
   a. Utilize a written plan which details the activities and projects to be completed.
   b. Perform written occupational objectives in the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
2. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
3. Utilize a set of written guidelines for the special project.
   a. Develop and follow a set of written guidelines for the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6

Course Name: Supervised Work Experience

Course Abbreviation: ROT 292(1-6)

Classification: Vocational-Technical Elective (Robotics Technology)

Description: This course is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in electrical/electronics related programs

Competencies and Suggested Objectives:

1. Apply technical skills needed to be a viable member of the work force.
   a. Prepare a description of technical skills to be developed in the supervised work experience program.
   b. Develop technical skills needed to be a viable member of the work force.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1
2. Apply skills developed in other program area courses.
   a. Perform skills developed in other program area courses in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Apply human relationship skills.
   a. Practice human relationship skills in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
4. Apply and practice positive work habits and responsibilities.
   a. Perform assignments to develop positive work habits and responsibilities.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
5. Work with instructor and employer to develop written occupational objectives to be accomplished.
   a. Perform written occupational objectives in the supervised occupational experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

6. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Utilize a set of written guidelines for the Supervised Work Experience.
   a. Develop and follow a set of written guidelines for the Supervised Work Experience.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

TELECOMMUNICATIONS TECHNOLOGY COURSES

Course Name: Fundamentals of Telecommunications

Course Abbreviation: TCT 1114

Classification: Vocational-Technical Core (Telecommunications Technology)

Description: This course is designed to acquaint the student with the history of voice/data communication, fundamental concepts, and basic telephone service. (4 sch: 3 hr. lecture, 2 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Discuss the history and development of voice/data communications.
   a. Define telecommunications systems and describe their identifying characteristics.
   b. Identify and describer the principal types of telecommunication systems available today.
   c. Explain the interrelationship between communications technology and computer technology and its effect upon both industries.
   d. Discuss historical telecommunications policy in the United States and the factors leading to its modification.
   e. Describe the restructuring of the telecommunications industry.
   f. Discuss education and career opportunities in telecommunications.
   g. Define and discuss common carriers.
   h. Discuss the orcin and the present status of the interconnect industry.
   i. Discuss the orcin and present status of specialized common carriers.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
2. Define, describe, and discuss all aspects of basic telephone service.
   a. Describe the principal parts of the telephone and explain the function of each.
   b. Define central office and explain its purpose.
   c. Describe the evolution of telephone switching equipment.
   d. Describe the characteristics of analog and digital signals.
   e. Describe the nationwide and worldwide numbering systems.
   f. Name and describer the principal types of telephone systems, telephone sets, and service features.
   g. Assemble/disassemble telephone sets.
   h. Perform functionality tests on a telephone set.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP5

3. Define, describe, and discuss fundamental concepts of data communications/networks.
   a. Describe the major components of both public and private telecommunication networks.
   b. Discuss the basic modes of transmission and their relation to various types of transmission media.
   c. Discuss AC/DC fundamentals as related to data communication/networking.
   d. Define data communications systems and explain their purpose.
   e. Define data communications systems and explain their purpose
   f. Discuss and distinguish between the different types data processing.
   g. Discuss local area networks (LANs)/.
   h. Explain the function of a modem and discuss different types of modulations.
   i. Define and discuss local and long distance telephone services.
   j. Identify and locate data communication specific parts of a typical computer system.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
4. Define, describe, and discuss telecommunications traffic engineering, management, and system implementation.
   a. Discuss traffic engineering as it relaters to telecommunications.
   b. Discuss busy-hour traffic and peak traffic as it relates to the prediction of future telephone usage and needs.
   c. Describe the basic functions and skills required of a telecommunications manager.
   d. Describe and discuss telecommunications policy as it relates to telephone usage.
   e. Describe the role of the telecommunications manager.
   f. Describe the implementation of a new telephone system and describe the function of a consultant in this process.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4

Course Name: Telephone Systems

Course Abbreviation: TCT 2214

Classification: Vocational-Technical Core (Telecommunications Technology)

Description: This course gives the student information and hands-on experience in installation, operation, troubleshooting, and repair of commercial use telephone systems including analog and digital key systems. (4 sch: 3 hr. lecture, 2 hr. lab)

Pre/Corequisites: Fundamentals of Telecommunications (TCT 1114)

Competencies and Suggested Objectives:

1. Explain and test the operation and installation of key systems.
   a. Describe the key systems advantages, components, and their functions, voltages, and operation.
   b. Describe the uses and limitations of block diagrams as they relate to installation.
   c. Plan a key system installation.
   d. Locate, identify, and interpret blueprint symbols for telephone installation.
   e. Install a key system using the proper tools, following manufacturer's specifications and proper grounding procedures.
   f. Identify malfunctions in the key system using approved troubleshooting procedures.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
2. Explain and test the operation and installation of digital key systems.
   a. Identify and describe the advantages, components and their functions, voltages, and operation.
   b. Describe the uses and limitations of block diagrams as they relate to installation.
   c. Explain and define the use and interconnection of data communications systems with the digital key system.
   d. Explain and outline network protocol as it pertains to the digital key system interaction with data communications networks.
   e. Plan a digital key system installation.
   f. Install a digital key system using the proper tools, following manufacturer's specifications and proper grounding procedures.
   g. Identify malfunctions in the digital key system using approved troubleshooting procedures.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5

Course Name: PBX Systems

Course Abbreviation: TCT 2224

Classification: Vocational-Technical Elective (Telecommunications Technology)

Description: This course is a continuation of the PBX section of Telephone Systems (TCT 2214). This course will further emphasize the installation, programming, and troubleshooting of PBX systems. Maintenance, cleaning, and paperwork will be covered. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Telephone Systems (TCT 2214)

Competencies and Suggested Objectives:

1. Discuss the general description of the PBX.
   a. Describe the equipment cabinet and identify the parts.
   b. Describe the function of circuit cards.
   c. Describe the power supply.
   d. Describe available features.
   e. Identify and inspect circuit cards.
   f. Describe installation requirements.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
2. Explain the system configuration.
   a. Describe the attendant console and display.
   b. Describe keyboard polling.
   c. Identify each section of the attendant console.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
3. Explain the paperwork involved for installation.
   a. Complete paperwork for system options, features, class of service options, extensions, extension range programming, hunt groups, mon-dial in trunks, dial in trunks, PIP/CCSA trunks, and trunk groups.
   b. Program the PBX as per the paperwork.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
4. Explain installation and test procedures and extension test procedures.
   a. Explain the purpose of flowcharts.
   b. Perform installation procedures.
   c. Perform test procedures.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

5. Explain and define PBX, maintenance, and troubleshooting procedures.
   a. Identify error codes.
   b. Locate error code display.
   c. Perform troubleshooting procedures.
   d. Perform maintenance of PBX systems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
6. Explain multi-line extension telephones.
   a. Describe system capability.
   b. Describe system integration with key systems.
   c. Program the system for multi-line telephones.
   d. Integrate the PBX with key systems.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4

Course Name: Digital Communications

Course Abbreviation: TCT 2324

Classification: Vocational-Technical Core (Telecommunications Technology)

Description: This course covers theories and concepts of data communications, design, and implementation. Different modulation systems will be examined such as PAM (pulse amplitude modulation), PTM (pulse time modulation), and PCM (pulse code modulation). The use of filtering to eliminate unwanted distortion is emphasized as well as contrasting the performance of PAM and PCM. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Electronic Communications (EET 2414)

Competencies and Suggested Objectives:

1. Review the characteristics and operation of digital modulation.
   a. Analyze and explain pulse code modulations systems.
   b. Analyze and explain frequency shift keying systems.
   c. Analyze and explain phase shift keying systems to include BPSK, QPSK, and higher orders.
   d. Analyze and explain quadrature amplitude modulation systems to include higher orders.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
2. Review various data communication methods.
   a. Explain various data communications standards to include demonstrating RE-232.
   b. Explain the operation of data modems.
   c. Analyze and explain error correcting codes.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5
3. Define, discuss, and troubleshoot PAM communication systems.
   a. Define aliasing and the nyguist rate.
   b. Explain why pre-filtering is necessary and how it is accomplished.
   c. Describe the main troubleshooting techniques for:
      (1) Signal flow tracing from input to output.
      (2) Signal flow tracing from output to input.
      (3) The divide-in-half method.
   d. Troubleshoot a PAM communications system.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

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4. Define, discuss, and troubleshoot PTM communication systems.
   a. Explain pulse position modulation (PPM) timing recovery.
   b. Explain offset error caused by error in the timing of the clock signal when it is regenerated at the receiver.
   c. Troubleshoot a PWM/PPM communication system.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
5. Discuss analog to digital (A/D) and digital to analog (D/A) conversion processes.
   a. Explain the applications of an analog to digital (A/D) converter in telecommunications.
   b. Explain the basic principles of the three types of A/D converters (ramp encoding converter, successive approximations converter, and combinational converter).
   c. Explain the applications of a digital to analog (D/A) converter.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
6. Analyze and troubleshoot pulse code modulation (PCM) communication systems.
   a. Troubleshoot a DPCM communications system.
   b. Troubleshoot a DM communications system.
   c. Differentiate between impulse and thermal noise.
   d. Explain how transmission errors occur during base band data transmission.
   e. Explain the signals used for back-channel transmission and reception.
   f. Measure the performance of a system in noise.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
7. Explain the different types of transmission modes.
   a. Explain full-duplex transmission over two-lines.
   b. Explain the use of the different types of signals in the modem.
   c. Explain half-duplex transmission.
   d. Explain full-duplex transmission over four-wire lines.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP4
8. Analyze and troubleshoot shift keying systems.
   a. Show how pseudo-random binary sequences (PRBSs) are similar to truly random signals.
   b. Troubleshoot an FSK modem.
   c. Troubleshoot a BPSK communications system.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Fundamentals of Digital Communications

Course Abbreviation: TCT 2314

Classification: Vocational-Technical Elective (Telecommunications Technology)

Description: This course covers theories and concepts of data communications, design, and implementation. Different modulation systems will be examined such as PAM (pulse amplitude modulation), PWM (pulse width modulation), and PCM (pulse code modulation). (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Fundamentals of Telecommunications (TCT 1114)

Competencies and Suggested Objectives:

1. Explain, define, and measure basic pulses and pulse characteristics as used in digital communications.
   a. Define and measure of basic pulse characteristics in the time domain.
   b. Define and perform experiments to compare the relationship between frequency and time characteristics.
   c. Explain and perform experiments to compare ideal and practical band-limited systems.
   d. Compare and perform experiments to measure the relationship between noise power and noise bandwidth.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4, WP5
2. Explain, define measure different characteristics, and troubleshoot PAM pulse amplitude modulation) signals and systems in the time and frequency domains.
   a. Define and perform experiments using natural and flat-top sampling.
   b. Explain and perform experiments to compare the message signal sampling signal.
   c. Define, explain, and perform experiments to determine aliasing and Nyquist rate.
   d. Explain and perform experiments to determine practical considerations in the choice of filter characteristics.
   e. Troubleshoot the PAM (pulse amplitude modulation) communications system.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
3. Explain, define, and measure different characteristics and troubleshoot Pulse Width/Pulse Position Modulation signals and systems.
   a. Explain and perform experiments to generate PWM (pulse width modulation) and PPM (pulse position modulation) signals.

b. Define, explain, and perform experiments to determine the effects of noise and band-limiting on PWM/PPM.
c. Troubleshoot the PWM/PPM communications system.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP6

Course Name: Microwave and Satellite Systems

Course Abbreviation: TCT 2414

Classification: Vocational-Technical Core (Telecommunications Technology)

Description: This course is designed to develop understanding and skills associated with microwave and satellite applications in the telecommunications industry. (4 sch: 3 hr. lecture, 2 hr. lab)

Pre/Corequisites: Fundamentals of Digital Communications (TCT 2314)

Competencies and Suggested Objectives:

1. Identify and discuss different microwave applications.
   a. Identify frequencies and bands used by the microwave spectrum.
   b. Draw a block diagram of a microwave radio transmitter/receiver system and explain its operation.
   c. Compare advantages and disadvantages of the different microwave transmission lines and accessories.
   d. Describe the difference between terminal, junction, and point-to-point relay stations used in microwave applications.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
2. Identify and describe functions of microwave component parts.
   a. Identify and describe the use of the different types of antennae.
   b. Describe the operation of the different types of solid state oscillators.
   b. Identify and describe the operation of the different types of power amplifiers used in microwave radios.
   d. Identify and describe the use of low noise microwave receivers.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP4
3. Identify and discuss satellite communication systems.
   a. Describe the basic principles of satellite reception.
   b. Identify the types of satellite systems and describe their functions and differences.
   c. Draw and define a block diagram of a satellite system including both up-link and down-link components.
   d. Set up both C and KU band television receive only (TVRO) satellite systems.
   e. Troubleshoot a TVRO system.

f. Describe commercial applications of mobile and fixed TVRO downlinking including teleconferencing, broadcast TV and radio, data streams, weather and commodity reports, etc.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP6

4. Identify and discuss cellular telephone systems.
   a. Draw and explain a block diagram of a cellular telephone system illustrating the process and equipment used in transmitting and receiving calls.
   b. Describe the process by which cellular telephones are interfaced with the public switched system.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP6

Course Name: Network Systems

Course Abbreviations: TCT 2424

Classification: Vocational-Technical Elective (Telecommunications Technology)

Description: This course covers networking fundamentals, voice networking, LANs and Internetworking. This course will cover upgrading of computers to support LAN technology including hardware and software and running and termination network media including Cat. 3 twisted pair cable, coaxial cable, and fiber optic cable. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Telephone Systems (TCT 2214), and Fundamentals of Fiber Optics (EET 2423)

Competencies and Suggested Objectives:

1. Discuss, describe, apply network fundamentals and install network software.
   a. Discuss the history of telecommunication's networking.
   b. Discuss the handling and routing of calls.
   c. Discuss and/or define standards and terminology.
   d. Discuss network architectures and OSI.
   e. Discuss, define, and relate analog and digital signals to networking.
   f. Discuss, describe, and relate transmission media to networking.
   g. Prepare both network hardware and software for computer installation.
   h. Identify proper card slots for hardware installation.
   i. Identify computer RAM and hard drive capabilities for operation of network software.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP2, WP5
2. Discuss and describe voice networks, troubleshoot network communications interface.
   a. Discuss the public and private switching telephone network.
   b. Discuss and describe voice processing and call distribution.
   c. Discuss and describe T1 networks.
   d. Discuss and describe virtual networks.
   e. Install network hardware and software.
   f. Troubleshoot network communications interface.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6
3. Discuss, describe, and identify wide area networks.
   a. Discuss and diagram SNA.
   b. Discuss and diagram X.25 packet switched networks.

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c. Discuss and diagram signaling system 7.
d. Discuss, operate, and troubleshoot an ISDN and SONET network media.

Related Academic Topics (See Appendix A): C5, C6
Workplace Skills (See Appendix B): WP5, WP6

4. Discuss, operate, and troubleshoot LAN and access the internet.
   a. Discuss and describe LANS.
   b. Run LAN Cat. 3, coaxial, and fiber optic cable.
   c. Discuss network software.
   d. Perform network experiments with E-mail.
   e. Discuss and interconnect with LANs.
   f. Discuss and define network protocols.
   g. Access the internet.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Special Project

Course Abbreviation: TCT 291(1-3)

Classification: Vocational-Technical Elective (Telecommunications Technology)

Description: This course is designed to provide the student with practical application of skills and knowledge gained in other electronics or electronics-related technical courses. The instructor works closely with the student to insure that the selection of a project will enhance the student's learning experience. (1-3 sch: 2-6 hr. lab)

Prerequisites: Consent of instructor

Competencies and Suggested Student Objectives:

1. Develop a written plan which details the activities and projects to be completed.
   a. Utilize a written plan which details the activities and projects to be completed.
   b. Perform written occupational objectives in the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
2. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6
3. Utilize a set of written guidelines for the special project.
   a. Develop and follow a set of written guidelines for the special project.
   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP6

Course Name: Supervised Work Experience

Course Abbreviation: TCT 292(1-6)

Classification: Vocational-Technical Elective (Telecommunications Technology)

Description: This course is a cooperative program between industry and education and is designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of semester hour per 45 industrial contact hours. (1-6 sch: 3-18 hr. externship)

Prerequisites: Consent of instructor and completion of at least one semester of advanced coursework in electrical/electronics related programs

Competencies and Suggested Objectives:

1. Apply technical skills needed to be a viable member of the work force.
   a. Prepare a description of technical skills to be developed in the supervised work experience program.
   b. Develop technical skills needed to be a viable member of the work force.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1
2. Apply skills developed in other program area courses.
   a. Perform skills developed in other program area courses in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
3. Apply human relationship skills.
   a. Practice human relationship skills in the supervised work experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
4. Apply and practice positive work habits and responsibilities.
   a. Perform assignments to develop positive work habits and responsibilities.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP3
5. Work with instructor and employer to develop written occupational objectives to be accomplished.
   a. Perform written occupational objectives in the supervised occupational experience program.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

6. Assess accomplishment of objectives.
   a. Prepare daily written assessment of accomplishment of objectives.
   b. Present weekly written reports to instructor in activities performed and objectives accomplished.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6
7. Utilize a set of written guidelines for the Supervised Work Experience.
   a. Develop and follow a set of written guidelines for the Supervised Work Experience.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP6

RELATED VOCATIONAL-TECHNICAL COURSES

Course Name: BASIC Programming Language

Course Abbreviation: CPT 1224

Classification: Vocational-Technical Elective (From Business and Office and Related Technology)

Description: This course is an introduction to computer programming using BASIC language routines to include sort, controlled loops, multidimensional arrays and modular programming. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Essential Skills for Postsecondary Business and Office and Related Technology Programs (BOV 101[1-6])

Suggested Student Objectives:

1. Demonstrate editing features available to add, delete and change lines in a BASIC program.
2. Design, flowchart, code, document, and run/debug a BASIC program.
3. Code a BASIC program which will illustrate the use of input/output functions, arithmetic operations, and conditional/relational operations.
4. Code a BASIC program which will illustrate techniques available to improve the appearance of a printed report. This should include the use of a printer spacing chart, image statements, and other printer functions.
5. Design, code, and run a BASIC program which will illustrate the use of interactive programming techniques.
6. Describe the difference between batch and on line coding.
7. Code a BASIC program which will illustrate the use of summarizing, subtotals, and group printing.
8. Utilizing structured programming techniques, design, code, and run a BASIC program which will illustrate the use of modular programming.
9. Design, code, and run a BASIC program which illustrates the use of controlled loops.
10. Design, code, and run a BASIC program which illustrates the use of array processing techniques and/or a multi-dimensional arrays.
11. Code a BASIC program which will illustrate the use of a sort routine.
12. Design, code, and run a BASIC program which will illustrate sequential and/or file processing techniques.

Course Name: Fundamentals of Drafting

Course Abbreviation: DDT 1113

Classification: Vocational-Technical Elective (From Drafting and Design Technology and Civil Technology Cluster)

Description: This course is designed to give drafting majors the background needed for all other drafting courses. Emphasis is placed on maintaining correct techniques while developing speed. (3 sch: 2 hr. lecture, 2 hr. lab)

Prerequisites: Baseline competencies in Drafting Technology

Competencies and Suggested Objectives:

1. Construct an offset section.
2. Construct a broken-out section.
3. Construct a removed section.
4. Construct a revolved section.
5. Construct an aligned section.
6. Demonstrate proper technique for sectioning ribs, webs, and spokes.
7. Construct three advanced isometric drawings.
8. Construct one advanced oblique drawing.
9. Construct one prospective drawing.
10. Demonstrate the proper techniques for dimensioning:
    a. Identify and draw basic types of lines used in dimensioning.
    b. Correctly apply dimensioning rules to drawing.
    c. Demonstrate the ability to use leader lines.
    d. Demonstrate the use of notations on drawings.
11. Define terms related to auxiliary views.
12. Label points and planes of three-view objects.
13. Construct auxiliary view of inclined plane.
14. Construct the true size of a curve shape.
15. Construct an auxiliary view of an oblique surface.
16. Construct a circle through three points.
17. Construct an ogee curve.
18. Construct an ellipse.
19. Construct two polygons.

Course Name: Introduction to Computers

Course Abbreviation: CPT 1114

Classification: Vocational-Technical Elective (From Business and Office and Related Technology)

Description: This courseis an introduction to information processing concepts and applications including operating systems, word processing, electronic spreadsheets, data management, graphics, and BASIC programming. Service course are not to be taken by Business and Office and Related Technology students. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: None

Competencies and Suggested Objectives:

1. Identify the advantages and disadvantages of the computer to individuals and businesses.
2. Identify the roles of and equipment used for input, processing, and output in an information system.
3. Identify common disk operating system procedures and file maintenance problems.
4. Identify terms associated with concepts in information processing.
5. Identify skills associated with information processing.
6. Identify correct safety procedures.
7. Develop keyboarding skills to produce mailable documents.
8. Demonstrate the ability to use a dictionary, word book, and a reference manual, thesaurus, and grammar verification software.
9. Prepare letters using full block and modified block letter styles and prepare envelopes according to U.S. Postal regulations.
10. Create and print mailable document to include:
    a. page format.
        (1) tabs
        (2) margins and page length
        (3) line spacing
    b. input text.
        (1) insert text
        (2) replace text
        (3) delete text
        (4) center
        (5) underline

c. edit document.
   (1) insert/delete a blank line
   (2) find and replace
   (3) block editing
      (a) copy
      (b) move
      (c) delete
d. spell check document.
e. save document.
f. print document.
   (1) print selected text
   (2) print entire document
g. get an existing file.

11. Complete a files management project on the microcomputer, to include:
    a. design a file
    b. add forms to the file
    c. edit selected forms
    d. delete selected forms
    e. generate reports
    f. print labels
12. Design and print a database report.
13. Design and print mailing labels on the microcomputer.
14. Use a spreadsheet program to prepare an appropriate template and insert given data for a personal, a business, and an education application to include the following features:
    a. column headings
    b. row headings
    c. delete headings
    d. set cell styles
    e. type values in cells
    f. create formulas
    g. recalculate
    h. print
15. Merge a database application and a spreadsheet application with a word processing document.
16. Generate and print graphs from given data.
17. Use available software to input personal, business, and organizational names in proper indexing order and produce an alphabetical list.
18. Write and run a simple program using BASIC statements to include CLS, New, REM, Print, Let, Input, Data, Read, If Then, Go To.
19. Back up and restore files.
20. State the goals of documentation.
21. Describe flow charting concepts.
22. Use directories and sub-directories.

23. Describe the importance of careful formatting.

Course Name: Principles of CAD

Course Abbreviation: DDT 1313

Classification: Vocational-Technical Elective (From Drafting and Design Technology and Civil Technology Cluster)

Description: This course will use CAD machines to design and draw various problems in the architectural, mechanical, and civil drafting areas. Emphasis will be placed on the operations of the CAD systems to solve these problems. (3 sch: 1 hr. lecture, 4 hr. lab)

Prerequisites: Essential Skills for Postsecondary Drafting and Design Technology Programs (DAV 101[1-6]) or Essential Skills for Postsecondary Civil Technology Programs (CIV 101[1-6])

Suggested Student Objectives:

1. Input data using alphanumeric keyboard and graphics tablet or mouse.
2. Access files and/or symbols from hard disk.
3. Store, retrieve, copy, and delete drawings and file.
4. Use the drawing editor.
5. Use draw and line menus.
6. Apply snap, grid, and pick commands.
7. Perform the following tasks:
   a. snapping to objects and the aperture
   b. display control and zoom
   c. naming and saving working displays with view
   d. panning
   e. redrawing and greening
8. Create a dimensioned drawing using CAD equipment.

SECTION III:

RECOMMENDED TOOLS AND EQUIPMENT

RECOMMENDED TOOLS AND EQUIPMENT FOR AUTOMATED MANUFACTURING TECHNOLOGY

1. Air compressor (5 hp) (1)
2. Computer systems (1 per 2 students)
3. Laser printers (1 per 2 students)
4. Dot matrix printer (1 per 2 students)
5. Computer bar-code reading systems (1)
6. Conveyor system (1)
7. Vision system (1)
8. Local area network system (with software) (1)
9. Robot system (SCARA type) (1)
10. Robot arm (fully articulated w/comp software and w/prg station) (1)
11. Robot system (linear) (1)
12. Robot (welding w/4-9 axes) (1)
13. Robot system (radio & video controlled/directed) (1)
14. Automatic storage and retrieval system (1)
15. Automatic tool change system (1)
16. CNC lathe and attachments (1)
17. CNC mill and attachments (1)
18. Industrial pneumatics training system (1)
19. Industrial hydraulics training system (1)
20. Digital volt-ohm-meters (1)
21. Oscilloscopes (50 Mhz dual trace) (1 per 2 students)
22. Programmable logic controller system (1)
23. Rotary actuators with powered slides systems (1)
24. Multi-motion actuators with powered slides systems (1)
25. Digitizer and power lift (1)
26. Gage, digametic height (1)
27. Gage, elec readout force w/cable (1)
28. Gage, set radius (1)
29. Gauging, sets of 13 items (1)
30. Graber frame computing board (1)
31. Joining machine, biscuit spline (1)
32. Meter, air velocity (1)
33. Meter, noise dosimeter (1)
34. Meter, sound level calibration (1)
35. Meter, sound octave bans analyzer (1)
36. Plotter w/stand (1)
37. Printer, graphics (1)
38. Pump, sampling personal portable (1)
39. Readout electronic w/ cable (1)
40. Robotic arm w/ comp software (1)

41. Bar coding system w/two readers (1)
42. Bench work wood w/two vises (1 per 3 students)
43. Bevel protractors, dial reading (2)
44. Caliper, digital electronic (2)
45. Camera, video VHS w/acc (2)
46. Vacuum, shop cleaner (1)
47. Computer, f/gauging system (1)
48. Computer, PC color w/acc (1 per 2 students)
49. Computer, station central (1)
50. Computer, station color central (1)
51. Router, form station prog CNC (1)
52. Sander, finish wood (1)
53. Terminal, graphic video (1)
54. Test, indicator dial set (1)
55. Tester cable and breakout box (1)
56. Tester, checker precision cable LE (1)
57. Tester, datacom (1)
58. Tester, surface roughness (1)
59. Video converter (1)
60. Vision system for CIM cell (1)
61. Visualizer, video close-up (1)
62. Woodworking machine w/acc (1)
63. Mechanical training lab trainer (1)
64. Computer upgrade & repair trainer (1)
65. Fluid power training lab trainer (1)
66. Programmable logic controller trainers (1per 3 students)
67. Multimedia training system (1)
68. Conveyor system (1)
69. Hydraulic test kit (1)
70. MegaMeter (1 per 3 students)
71. Safety Goggles

RECOMMENDED TOOLS AND EQUIPMENT FOR COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY

(Tools and equipment as listed for Electronics Technology)

RECOMMENDED TOOLS AND EQUIPMENT FOR COMPUTER SERVICING TECHNOLOGY

1. Fault insertion troubleshooting computer w/monitor, printer, and complete documentation including diagnostic software, schematics, and manufacturer's specifications (1 per 3 students)
2. Analog fault insertion troubleshooting trainer and complete documentation including schematics and manufacturer's specifications (1)
3. Digital multimeter (1 per 2 students)
4. Oscilloscope (1 per 3 students)
5. Signal generator, RF/AF (1)
6. Frequency generator (1)
7. Frequency counter (1)
8. Logic probe (1 per 3 students)
9. Logic pulser (1 per 3 students)
10. Logic monitor (1 per 3 students)
11. Current probe (1per 2 students)
12. Logic pulse analyzer (1)
13. RS 232 breakout box (1)
14. Logic clip sets, including 14, 16, 18, 24, and 40 pin (1)
15. Integrated circuit puller and inserter (1)
16. Nut driver set (1 per 3 students)
17. Screwdriver set (1 per 3 students)
18. Allen wrenches (English and metric) (1 set each)
19. Solder station including iron, holder, and solder sucker (1 per 2 students)
20. Student tool kit:
    Wire side cutter (1)
    Needle nose pliers (1)
    Adjustable wrench (6") (1)
    Safety Goggles
21. Lab work benches (1 per 4 students)
22. Lab work stool (1 per student)
23. High intensity lamp w/magnifying lens (1 per student)
24. Circuit board vise (1 per work bench)

RECOMMENDED TOOLS AND EQUIPMENT FOR ELECTRICAL TECHNOLOGY

1. Electrical hand tools: Lineman pliers, wire strippers, screwdrivers, needlenose pliers, tool pouch, ruler, folding rule, safety glasses. (1 set per student)
2. Digital VOMs (1 per 2 students)
3. Analog VOMs (1 per 2 students)
4. Ammeters (2)
5. Watt Meter (1)
6. Megometer (1)
7. Tachometers (2)
8. Oscopes(1 per 2 students)
9. Hand conduit benders - ½", ¾", 1" (1 each)
10. Ratchet conduit bender ½ to 1" (1)
11. Hydraulic conduit bender 1¼ to 2" (1)
12. PVC bender up to 2" (1)
13. Electric drills ½" and ⅜" (1 each)
14. Rechargeable electric drills (1)
15. ½" to 2" Manual knock-out cutters (1)
16. ½" to 2" hydraulic knock-out cutters (1)
17. ½ - 2" hand threaders (1)
18. Hand held electric pipe threaders, ½ - 2" (1)
19. Power threader up to 2" (1)
20. Power threader PTO driven (1)
21. Power fish system (1)
22. Sets stack scaffold with wheels (2 stacks)
23. Electric wire pulling system (1)
24. Pedestal drill press (1)
25. Pedestal grinders (1)
26. Electric portable band saw (1)
27. Circular band electric saw (1)
28. Hand grinder/polisher (1)
29. Reciprocating portable saw (1)
30. Pipe reamer (1)
31. Portable jig saw (1)
32. Rota hammer (1)
33. Right angle drill ½" (1)
34. 4', 6', 10', and 12' fiberglass stepladders (1each)
35. Fiberglass extension ladder, 14' (1)
36. Chain pipe vices on tripod (1)
37. Machinist Vice (1)
38. Work tables (1 per 2 students)
39. Dissertable Machine (Motor) trainers - AC & DC (2)

40. PLC trainers with troubleshooting capabilities (1 per 2 students)
41. Computers (1 per 2 students)
42. Vision system trainers (3)
43. Industrial motor control trainers - AC and DC (1 per 2 students)
44. Input/output analog trainers (1 per 2 students)
45. Electro/mechanical trainers (3)
46. Motor control troubleshooting trainers (1 per 2 students)
47. AC/DC trainers (1 per 2 students)
48. Fire alarm trainers (1)
49. Burglar alarm trainers (1)
50. Digital trainers (1 per 2 students)
51. Wet/dry shop vacuum (1)
52. Air compressor (1)
53. Fiber optic splicing kits (cleaver included) (1 per 2 students)
54. Db loss meters/fiber optic (2)
55. Fusion splicer/fiber optic (1)

INSTRUCTIONAL AIDS

1. Transformer Trainer (2)
2. Power Supply Trainer (2)

RECOMMENDED TOOLS AND EQUIPMENT FOR ELECTRONICS TECHNOLOGY, COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY, AND TELECOMMUNCIATIONS TECHNOLOGY

1. Power Supply (1 per station)
2. Multimeter Analog/Digital (1)
3. O'Scope Digital Storage (1)
4. O'Scope (1)
5. LCR Meter (1)
6. Capacitance Meter (1)
7. Function Generator (1)
8. Frequency Counter (1)
9. Ground Fault Tester (1)
10. High Potential Tester (1)
11. Isolation Transformer (1)
12. Laser Power Meter (1)
13. Light Intensity Meter (1)
14. Logic Analyzer (1)
15. Logic Probe (1)
16. Logic Pulser (1)
17. Electric drills, ½" and ⅜"
    Pedestral drill press
    Pedestral grinders
    Hand grinder
18. RF Power Meter (1)
19. RF Signal Generator (1)
20. Semiconductor Tester (1)
21. Soldering Station (Throughole & SMD) (1 per 2 students)
22. Soldering/Desoldering Station (Throughole & SMD) (1 per 2 students)
23. Spectrum Analyzer (1)
24. Sensors & Transducer (1)
25. Adjustable Isolation Transformer (1)
26. Clamp on Amp Meter (1)
27. Vector Impedance Meter (1)
28. Air Compressor (1)
29. Vacuum Cleaner (dry and wet) (1)
30. Dummy Load (1)
31. Electric Field-Strength Meter (1)
32. Curve Tracer (1)
33. SWR Meter (1)
34. PROM Programmer (1)
35. PLD Programmer (1)

36. Proto Board (1)
37. Electronic Trainer (Base Station) (1 per 2 students)
38. DC Trainer CAI/BreadBoard (1 per 2 students)
39. AC Trainer CAI/ BreadBoard (1 per 2 students)
40. Digital Trainer CAI/BreadBoard (1 per 2 students)
41. Solid State Devices CAI/BreadBoard (1 per 2 students)
42. Microprocessor CAI/BreadBoard (1)
43. Linear Integrated Circuits CAI/BreadBoard (1)
44. Electronics Communication CAI/BreadBoard (1)
45. Microprocessor Interfacing CAI/BreadBoard (1)
46. TV Trainer (1)
47. VCR Trainer (1)
48. Camcorder Trainer (1)
49. Fiber Optic Trainer (1)
50. Audio Amplifier & Speakers (1)
51. Hydraulic trainer (1)
52. Pneumatic trainer (1)
53. PLC
54. Fiber optic splicing kits (1)
55. Industrial motor control trainer (1)
56. Motor control troubleshooter (1)
57. Interfacing trainer (1)
58. High intensity lamps (1 per work station)
59. Magnifying lamps (3)
60. Work benches (1 per 4 students)
61. Megohm meter (1)
62. Color ban generator (1)
63. Dot/crosshatch/bargenerator (1)
64. Sweep marker generator (1)
65. Signal tracer (1)
66. Video analyzer (1)
67. Stereo analyzer (1)
68. Capacitor and inductor analyzer (1)
69. Flyback yoke tester (1)
70. CRT checker (1)
71. Tuner substitution unit (1)
72. High voltage probe (1)
73. VCR alignment tools (1 set)
74. Antenna trainer (1)
75. Computer monitor tester (1)
76. Breakout box (1)
77. CRT restorer (1)
78. Telephone Analyzer (1)

79. Student Tool Kit
    Adjustable Wrench Set: 6", 8", 10"
    Calipers: 6"
    Drill Bit Set: 14 pieces
    Flashlight: 1 AAA cell, 1 D cell
    Hammer: Claw and Rubber
    Pliers: Bent Nose, Diagonal, Long Nose, Needle Nose Diagonal, Locking, and Slip Joint
    Nut Driver Set
    Screwdriver Sets: Offset, Phillips, Slotted, and Torx
    Socket Set: Metric and Standard
    Tape Measure: 25'
    Wrench Set: Metric and Standard Ignition, Combination Metric, Combination Standard
    Safety Goggles

INSTRUCTIONAL AIDS

1. Computer for Computer Aided Instruction (Printers, Cables, A/B box, etc.) (1)
2. Monitor (1)
3. VCR and cart (1)
4. VGA viedo adapter (1)
5. LCD display unit (1)
6. Overhead projector (1)
7. Slide projector (1)

RECOMMENDED TOOLS AND EQUIPMENT FOR INSTRUMENTATION TECHNOLOGY

1. Hydraulic trainers (1)
2. Pneumatic trainers (1)
3. Level process trainer (1)
4. Flow process trainer (1)
5. Temperature process trainer (1)
6. Pressure process trainer (1)
7. DCS (Digital Control System) (1)
8. Dead weight tester (1)
9. Calibration stations (1 per 2 students)
10. Analysis trainer (1)
11. Test equipment (1 set)
12. Digital meters (1 per 2 students)
13. Oscilloscopes (1 per 2 students)
14. Current measuring devices (1 per 2 students)
15. Temperature meters (3)
16. Portable calibrators (2)
17. Sensor trainers (1 per 3 students)
18. Computer process control hardware (1)
19. Electromechanical trainers (1 per 3 students)
20. Programmable logic controllers trainers (1 per 3 students)
21. Basic hand tools
    Pliers, wire strippers, screwdrivers, needlenose pliers, ruler, safety glasses
22. Pressure gage repair kits (1)
23. CAD software (1)

RECOMMENDED TOOLS AND EQUIPMENT FOR ROBOTICS TECHNOLOGY

1. Industrial grade robots (min $25,000), with end effectors (1)
2. Educational grade robots (min $7,000), with end effectors (1)
3. PLCs (2)
4. Industrial hydraulic trainers (1)
5. Industrial pneumatic trainers (1)
6. Industrial mechanical system trainers (min $9,000) (1)
7. Industrial servo trainers (1)
8. Computers and printers/plotters (1)
9. Power tools:
   ½" and ⅜" drill motors
   Pedestral drill press
10. Tachometers (3)
11. Bench vise (1 per work station)
12. Bench grinder (2)
13. Set of drill bits (⅛ - ½" drill index)
14. Vision system trainers (1)
15. Wet/dry vacuum (1)
16. Set of tap and die, 3/16 - 1/2"
17. Safety devices, i.e., light curtain safety mats (1 per work station)
18. Special end effectors of robots (as per robots)
19. Safety Goggles

INSTRUCTIONAL AIDS

1. TV/VCR (1)
2. Hydraulic simulator software (1)
3. Pneumatic simulator software (1)
4. Robotic simulation software (1)
5. PLC programming software (1)
6. Overhead projector (1)

RECOMMENDED TOOLS AND EQUIPMENT FOR TELECOMMUNICATIONS TECHNOLOGY

(Tools and equipment as listed for Electronics Technology)

APPENDIX A:

RELATED ACADEMIC TOPICS

APPENDIX A

RELATED ACADEMIC TOPICS FOR COMMUNICATIONS

C1 Interpret written material.
C2 Interpret visual materials (maps, charts, graphs, tables, etc.).
C3 Listen, comprehend, and take appropriate actions.
C4 Access, organize, and evaluate information.
C5 Use written and/or oral language skills to work cooperatively to solve problems, make decisions, take actions, and reach agreement.
C6 Communicate ideas and information effectively using various oral and written forms for a variety of audiences and purposes.

EXPANDED TOPICS FOR COMMUNICATIONS

TOPIC C1: Interpret written material.

C1.01 Read and follow complex written directions.
C1.02 Recognize common words and meanings associated with a variety of occupations.
C1.03 Adjust reading strategy to purpose and type of reading.
C1.04 Use sections of books and reference sources to obtain information.
C1.05 Compare information from multiple sources and check validity.
C1.06 Interpret items and abbreviations used in multiple forms.
C1.07 Interpret short notes, memos, and letters.
C1.08 Comprehend technical words and concepts.
C1.09 Use various reading techniques depending on purpose for reading.
C1.10 Find, read, understand, and use information from printed matter or electronic sources.

TOPIC C2: Interpret visual materials (maps, charts, graphs, tables, etc.).

C2.01 Use visuals in written and in oral presentations.
C2.02 Recognize visual cues to meaning (layout, typography, etc.).
C2.03 Interpret and apply information using visual materials.

TOPIC C3: Listen, comprehend, and take appropriate action.

C3.01 Identify and evaluate orally-presented messages according to purpose.
C3.02 Recognize barriers to effective listening.
C3.03 Recognize how voice inflection changes meaning.
C3.04 Identify speaker signals requiring a response and respond accordingly.
C3.05 Listen attentively and take accurate notes.
C3.06 Use telephone to receive information.

C3.07 Analyze and distinguish information from formal and informal oral presentations.

TOPIC C4: Access, organize, and evaluate information.

C4.01 Distinguish fact from opinion.
C4.02 Use various print and non-print sources for specialized information.
C4.03 Interpret and distinguish between literal and figurative meaning.
C4.04 Interpret written or oral communication in relation to context and writer's point of view.
C4.05 Use relevant sources to gather information for written or oral communication.

TOPIC C5: Use written and/or oral language skills to work cooperatively to solve problems, make decisions, take actions, and reach agreement.

C5.01 Select appropriate words for communication needs.
C5.02 Use reading, writing, listening, and speaking skills to solve problems.
C5.03 Compose inquiries and requests.
C5.04 Write persuasive letters and memos.
C5.05 Edit written reports, letters, memos, and short notes for clarity, correct grammar, and effective sentences.
C5.06 Write logical and understandable statements, phrases, or sentences for filling out forms, for correspondence or reports.
C5.07 Write directions or summaries of processes, mechanisms, events, or concepts.
C5.08 Select and use appropriate formats for presenting reports.
C5.09 Convey information to audiences in writing.
C5.10 Compose technical reports and correspondence that meet accepted standards for written communications.

TOPIC C6: Communicate ideas and information using oral and written forms for a variety of audiences and purposes.

C6.01 Give complex oral instructions.
C6.02 Describe a business or industrial process/mechanism.
C6.03 Participate effectively in group discussions and decision making.
C6.04 Produce effective oral messages utilizing different media.
C6.05 Explore ideas orally with partners.
C6.06 Participate in conversations by volunteering information when appropriate and asking relevant questions when appropriate.
C6.07 Restate or paraphrase a conversation to confirm one's own understanding.
C6.08 Gather and provide information utilizing different media.

C6.09 Prepare and deliver persuasive, descriptive, and demonstrative oral presentations.

RELATED ACADEMIC TOPICS FOR MATHEMATICS

M1 Relate number relationships, number systems, and number theory.
M2 Explore patterns and functions.
M3 Explore algebraic concepts and processes.
M4 Explore the concepts of measurement.
M5 Explore the geometry of one-, two-, and three-dimensions.
M6 Explore concepts of statistics and probability in real world situations.
M7 Apply mathematical methods, concepts, and properties to solve a variety of real-world problems.

EXPANDED TOPICS FOR MATHEMATICS

TOPIC M1: Relate number relationships, number systems, and number theory.

M1.01 Understand, represent, and use numbers in a variety of equivalent forms (integer, fraction, decimal, percent, exponential, and scientific notation) in real world and mathematical problem situations.
M1.02 Develop number sense for whole numbers, fractions, decimals, integers, and rational numbers.
M1.03 Understand and apply ratios, proportions, and percents in a wide variety of situations.
M1.04 Investigate relationships among fractions, decimals, and percents.
M1.05 Compute with whole numbers, fractions, decimals, integers, and rational numbers.
M1.06 Develop, analyze, and explain procedures for computation and techniques for estimations.
M1.07 Select and use an appropriate method for computing from among mental arithmetic, paper-and-pencil, calculator, and computer methods.
M1.08 Use computation, estimation, and proportions to solve problems.
M1.09 Use estimation to check the reasonableness of results.

TOPIC M2: Explore patterns and functions.

M2.01 Describe, extend, analyze, and create a wide variety of patterns.
M2.02 Describe and represent relationships with tables, graphs, and rules.
M2.03 Analyze functional relationships to explain how a change in one quantity results in a change in another.
M2.04 Use patterns and functions to represent and solve problems.
M2.05 Explore problems and describe results using graphical, numerical, physical, algebraic, and verbal mathematical models or representations.

M2.06 Use a mathematical idea to further their understanding of other mathematical ideas.

M2.07 Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as art, music, and business.

TOPIC M3: Explore algebraic concepts and processes.

M3.01 Represent situations and explore the interrelationships of number patterns with tables, graphs, verbal rules, and equations.

M3.02 Analyze tables and graphs to identify properties and relationships and to interpret expressions and equations.

M3.03 Apply algebraic methods to solve a variety of real world and mathematical problems.

TOPIC M4: Explore the concepts of measurement.

M4.01 Estimate, make,and use measurements to describe and compare phenomena.

M4.02 Select appropriate units and tools to measure to the degree of accuracy required in a particular situation.

M4.03 Extend understanding of the concepts of perimeter, area, volume, angle measure, capacity, and weight and mass.

M4.04 Understand and apply reasoning processes, with special attention to spatial reasoning and reasoning with proportions and graphs.

TOPIC M5: Explore the geometry of one-, two-, and three-dimensions.

M5.01 Identify, describe, compare, and classify geometric figures.

M5.02 Visualize and represent geometric figures with special attention to developing spatial sense.

M5.03 Explore transformations of geometric figures.

M5.04 Understand and apply geometric properties and relationships.

M5.05 Classify figures in terms of congruence and similarity and apply these relationships.

TOPIC M6: Explore the concepts of statistics and probability in real world situations.

M6.01 Systematically collect, organize, and describe data.

M6.02 Construct, read, and interpret tables, charts, and graphs.

M6.03 Develop an appreciation for statistical methods as powerful means for decision making.

M6.04 Make predictions that are based on exponential or theoretical probabilities.

M6.05 Develop an appreciation for the pervasive use of probability in the real world.

TOPIC M7: Apply mathematical methods, concepts, and properties to solve a variety of real-world problems.

M7.01 Use computers and/or calculators to process information for all mathematical situations.
M7.02 Use problem-solving approaches to investigate and understand mathematical content.
M7.03 Formulate problems from situations within and outside mathematics.
M7.04 Generalize solutions and strategies to new problem situations.

RELATED ACADEMIC TOPICS FOR SCIENCE

S1 Explain the Anatomy and Physiology of the human body.
S2 Apply the basic biological principles of Plants, Viruses and Monerans, Algae, Protista, and Fungi.
S3 Relate the nine major phyla of the kingdom animalia according to morphology, anatomy, and physiology.
S4 Explore the chemical and physical properties of the earth to include Geology, Meteorology, Oceanography, and the Hydrologic Cycle.
S5 Investigate the properties and reactions of matter to include symbols, formulas and nomenclature, chemical equations, gas laws, chemical bonding, acid-base reactions, equilibrium, oxidation-reduction, nuclear chemistry, and organic chemistry.
S6 Explore the principles and theories related to motion, mechanics, electricity, magnetism, light energy, thermal energy, wave energy, and nuclear physics.
S7 Explore the principles of genetic and molecular Biology to include the relationship between traits and patterns of inheritance, population genetics, the structure and function of DNA, and current applications of DNA technology.
S8 Apply concepts related to the scientific process and method to include safety procedures for classroom and laboratory; use and care of scientific equipment; interrelationships between science, technology and society; and effective communication of scientific results in oral, written, and graphic form.

EXPANDED TOPICS FOR SCIENCE

TOPIC S1: Explain the Anatomy and Physiology of the human body.

S1.01 Recognize common terminology and meanings.
S1.02 Explore the relationship of the cell to more complex systems within the body.

S1.03 Summarize the functional anatomy of all the major body systems.
S1.04 Relate the physiology of the major body systems to its corresponding anatomy.
S1.05 Compare and contrast disease transmission and treatment within each organ system.
S1.06 Explore the usage of medical technology as related to human organs and organ systems.
S1.07 Explain the chemical composition of body tissue.

TOPIC S2: Apply the basic biological principles of Plants, Viruses and Monerans, Algae, Protista, and Fungi.

S2.01 Identify the major types and structures of plants, viruses, monera, algae protista, and fungi.
S2.02 Explain sexual and asexual reproduction.
S2.03 Describe the ecological importance of plants as related to the environment.
S2.04 Analyze the physical chemical and behavioral process of a plant.

TOPIC S3: Relate the nine major phyla of the kingdcm animalia according to morphology, anatomy, and physiology.

S3.01 Explain the morphology, anatomy, and physiology of animals.
S3.02 Describe the characteristics, behaviors, and habitats of selected animals.

TOPIC S4: Explore the chemical and physical properties of the earth to include Geology, Meteorology, Oceanography, and the Hydrologic Cycle.

S4.01 Examine minerals and their identification, products of the rock cycle, byproducts of weathering, and the effects of erosion.
S4.02 Relate the Hydrologic Cycle to include groundwater its zones, movement, and composition; surface water systems, deposits, and runoff.
S4.03 Consider the effects of weather and climate on the environment.
S4.04 Examine the composition of seawater; wave, tides, and currents; organisms, environment, and production of food; energy, food and mineral resources of the oceans.

TOPIC S5: Investigate the properties and reactions of matter to include symbols, formulas and nomenclature, chemical equations, gas laws, chemical bonding, acid-base reactions, equilibrium, oxidation-reduction, nuclear chemistry, and organic chemistry.

S5.01 Examine the science of chemistry to include the nature of matter, symbols, formulas and nomenclature, and chemical equations.

S5.02 Identify chemical reactions including precipitation, acids-bases, and reduction-oxidation.
S5.03 Explore the fundamentals of chemical bonding and principles of equilibrium.
S5.04 Relate the behavior of gases.
S5.05 Investigate the structure, reactions, and uses of organic compounds; and investigate nuclear chemistry and radiochemistry.

TOPIC S6: Explore the principles and theories related to motion, mechanics, electricity, magnetism, light energy, thermal energy, wave energy, and nuclear physics.

S6.01 Examine fundamentals of motion of physical bodies and physical dynamics.
S6.02 Explore the concepts and relationships among work, power, and energy.
S6.03 Explore principles, characteristics, and properties of electricity, magnetism, light energy, thermal energy, and wave energy.
S6.04 Identify principles of modern physics related to nuclear physics.

TOPIC S7: Explore the principles of genetic and molecular Biology to include the relationship between traits and patterns of inheritance; population genetics, the structure and function of DNA, and current applications of DNA technology.

S7.01 Examine principles, techniques, and patterns of traits and inheritance in organisms.
S7.02 Apply the concept of population genetics to both microbial and multicellular organism.
S7.03 Identify the structure and function of DNA and the uses of DNA technology in science, industry, and society.

TOPIC S8: Apply concepts related to the scientific process and method to include safety procedures for classroom and laboratory; use and care of scientific equipment; interrelationships between science, technology and society; and effective communication of scientific results in oral, written, and graphic form.

S8.01 Apply the components of scientific processes and methods in classroom and laboratory investigations.
S8.02 Observe and practice safe procedures in the classroom and laboratory.
S8.03 Demonstrate proper use and care for scientific equipment.
S8.04 Investigate science careers, and advances in technology.
S8.05 Communicate results of scientific investigations in oral, written, and graphic form.

APPENDIX B:

WORKPLACE SKILLS

APPENDIX B
WORKPLACE SKILLS FOR THE 21ST CENTURY

WP1 Allocates resources (time, money, materials and facilities, and human resources).

WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.

WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.

WP5 Selects, applies, and maintains/troubleshoots technology.

WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.

APPENDIX C:

STUDENT COMPETENCY PROFILES

STUDENT COMPETENCY PROFILE
FOR
AUTOMATED MANUFACTURING TECHNOLOGY

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Systems Programming I (MFT 1123)

_____ 1. Demonstrate the capability to install software.
_____ 2. Develop and use programming fundamentals.
_____ 3. Develop program techniques.

Principles of Automation I (MFT 1214)

_____ 1. Demonstrate safety procedures.
_____ 2. Describe and explain the characteristics and applications of solid state devices used in control systems.
_____ 3. Demonstrate the ability to troubleshoot a power supply.
_____ 4. Explain the application of the operation of operational amplifiers.
_____ 5. Explain the theory of operation of AC/DC motors, tachometers, optical encoders, servos, resolvers, and stepped motors.
_____ 6. Explain the principles of the operation of mechanical drives.
_____ 7. Apply the fundamental principles of digital principles.

Computer Upgrade and Repair (MFT 1613)

_____ 1. Explain system features of IBM compatible computers.
_____ 2. Identify components of different types of IBM compatible PCs.
_____ 3. Apply the principles of compatibility of IBM systems.
_____ 4. Perform system tear down and inspection.
_____ 5. Perform systems diagnosis on a faulty computer system.

Automated Motion Control (MFT 2013)

_____ 1. Identify a Servo Motion Control (SMC) Systems Application in Production Mode.
_____ 2. Gather information for systems diagnosis.

_____ 3. Diagnose and correct a faulted application.

Materials Requirement Planning (MRP) (MFT 2113)

_____ 1. Explain the methods of managing resources of a manufacturing company more productively.
_____ 2. Execute an MRP plan.
_____ 3. Collect information regarding a Closed Loop MRP.

Principles of Automation II (MFT 2224)

_____ 1. Perform diagnosis of malfunctions in automated machinery.
_____ 2. Write application programs for automated subsystems including CNC, robotics, Vision, etc.
_____ 3. Develop PLC interfacing applications for use in flexible automated systems.

Statistical Process Control (MFT 2313)

_____ 1. Describe and discuss the underling philosophy of SPC.
_____ 2. Apply SPC concepts.

Computer Integrated Manufacturing (MFT 2413)

_____ 1. Develop the ability to discuss the evolution and principles of CIM.
_____ 2. Develop a CIM application.

Data Acquisition and Communications (MFT 2513)

_____ 1. Explain data communication components used in automatic systems.
_____ 2. Use data communication software and test the equipment.
_____ 3. Use computers and/or controllers for data acquisition.

Special Project (MFT 291(1-3))

_____ 1. Develop a written plan which details the activities and projects to be completed.
_____ 2. Assess accomplishment of objectives.
_____ 3. Utilize a set of written guidelines for the special project.

Supervised Work Experience (MFT 292(1-6))

_____ 1. Apply technical skills needed to be a viable member of the work force.
_____ 2. Apply skills developed in other program area courses.
_____ 3. Apply human relationship skills.
_____ 4. Apply and practice positive work habits and responsibilities.
_____ 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
_____ 6. Assess accomplishment of objectives.
_____ 7. Utilize a set of written guidelines for the Supervised Work Experience.

Commercial and Industrial Wiring (ELT 1123)

_____ 1. Demonstrate the ability to apply general safety rules.
_____ 2. Demonstrate the ability to install and maintain raceways, conduit, and fittings.
_____ 3. Demonstrate the installation of different types of three-phase service entrances, metering devices, main panels, raceways or ducts, subpanels, feeder circuits, and branch circuits according to electrical codes.
_____ 4. Develop a cost estimate for a job to include supplies and labor costs.

Motor Control Systems (ELT 1413)

_____ 1. Demonstrate the ability to install and troubleshoot different control circuits and devices.

Programmable Logic Controllers (ELT 2613)

_____ 1. Describe the principles of PLC's.
_____ 2. Utilize the different types of PLC hardware.
_____ 3. Demonstrate mastery of numbering systems, encoding/decoding, logical operations, and Boolean expressions.
_____ 4. Demonstrate the ability to program all types of internal and discrete instructions.
_____ 5. Demonstrate the ability to troubleshoot and maintain different programmable controllers systems.

Fundamentals of Electronics (EET 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environments.
_____ 2. Demonstrate and utilize proper breadboarding techniques.
_____ 3. Demonstrate proficiency in the use of a calculator.
_____ 4. Demonstrate the proper use and operation of test equipment.
_____ 5. Demonstrate proper soldering and desoldering techniques.

DC Circuits (EET 1114)

_____ 1. Demonstrate and apply an understanding of a basic electrical circuit.
_____ 2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.
_____ 3. Analyze and evaluate the parameters of a series circuit.
_____ 4. Analyze and evaluate the parameters of a parallel circuit.
_____ 5. Analyze and evaluate the parameters of a series-parallel circuit.
_____ 6. Apply network theorems to the analysis of complex circuits.
_____ 7. Explain capacitance and demonstrate its application in DC and transient circuits.
_____ 8. Explain inductance and demonstrate its application in DC and transient circuits.

AC Circuits (EET 1123)

_____ 1. Analyze a sine wave and explain its characteristics and application to AC circuits.
_____ 2. Analyze inductive and capacitive reactance in series and parallel circuits.
_____ 3. Analyze transformer voltage, current, impedance transformations, and applications.
_____ 4. Explain RLC non-resonant circuits.
_____ 5. Explain RLC resonant circuits.
_____ 6. Explain and classify filters.

Solid State Devices and Circuits (EET 1314)

_____ 1 Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
_____ 2 Explain semiconductor diode theory and apply to diode circuits.
_____ 3 Analyze the operation of semiconductor special purpose diodes.

_____ 4. Analyze the operation of bipolar junction transistors.
_____ 5. Explain and demonstrate the biasing of a transistor.
_____ 6. Explain and analyze the construction of BJT amplifiers.
_____ 7. Analyze the operation of field effect transistors and demonstrate their applications.
_____ 8. Analyze the operation of thyristors and demonstrate their applications.

Microprocessors (EET 1324)

_____ 1. Demonstrate an understanding of microprocessor structure and terminology.
_____ 2. Analyze the architectural design of microprocessors.
_____ 3. Describe the use of instruction sets and machine codes in operating microprocessors.
_____ 4. Understand principles and operation of types of microprocessor memory circuits.
_____ 5. Develop, execute, and debug microprocessor programs in assembly language.

Computer Fundamentals for Electronics/Electricity (EET 1613)

_____ 1. Demonstrate the essentials of microcomputer components.
_____ 2. Demonstrate an understanding of essential microcomputer peripherals.
_____ 3. Demonstrate an understanding of essential microcomputer operating systems.
_____ 4. Demonstrate an understanding of essential microcomputer architecture.
_____ 5. Create a batch file.
_____ 6. Use editing, debugging techniques.
_____ 7. Set up and configure a microcomputer using operating system.
_____ 8. Demonstrate competency with a graphic operating system.

Interfacing Techniques (EET 2514)

_____ 1. Describe Industry Standards for Interfacing.
_____ 2. Identify signals related to parallel and serial ports.
_____ 3. Describe interfacing requirements of computer peripherals.
_____ 4. Describe special purpose large scale integration devices.
_____ 5. Explain and demonstrate methods for converting physical variables.
_____ 6. Use microprocessor to evaluate data as a result of physical variables taking place.

Fluid Power (INT 1214)

_____ 1. Define and describe basic laws governing fluids.
_____ 2. Identify and draw symbols for hydraulics and pneumatics.
_____ 3. Describe operation and nomenclature of various pumps and compressors.
_____ 4. Explain fluids as pertaining to the transmission of energy.
_____ 5. Describe the operation of flow, pressure, and directional control valves.
_____ 6. Explain the types of actuators used in pneumatics and hydraulics.
_____ 7. Explain, construct, and troubleshoot various hydraulic and pneumatic circuits.
_____ 8. Demonstrate the use of electro-mechanical controls in hydraulic and pneumatic circuits.

Control Systems I (INT 2114)

_____ 1. Explain and apply basic safety regulations which must be followed.
_____ 2. Describe and discuss temperature measurement devices.
_____ 3. Describe and discuss pressure measurement devices.
_____ 4. Describe and discuss level measurement devices and their use.
_____ 5. Describe flow measurement devices and their use.
_____ 6. Describe senors used in process analysis.
_____ 7. Describe information transmission pertaining to process control.

Control Systems II (INT 2124)

_____ 1. Identify and describe parameters and variables of an operational process control system.
_____ 2. Describe control valve characteristics.
_____ 3. Describe various modes of process control.
_____ 4. Describe advanced control methods.
_____ 5. Troubleshoot process control loops.
_____ 6. Demonstrate procedures for handling, storing, and disposing of hazardous materials.

Calibration and Measurement Principles (INT 2214)

_____ 1. Define terms associated with measurement and calibration procedures.
_____ 2. Describe a standard calibration procedure.

_____ 3. Describe and perform specialized calibrations of differential pressure (DP) cells.
_____ 4. Describe and demonstrate Statistical Process Control (SPC).

Fundamentals of Robotics (ROT 1113)

_____ 1. Describe the various major components of all robots.
_____ 2. Demonstrate safety procedures used in the automated environment.
_____ 3. Demonstrate the ability to operate robots.

Industrial Robotics (ROT 1313)

_____ 1. Demonstrate an ability to integrate a robot into a process.
_____ 2. Demonstrate an ability to integrate peripheral equipment.
_____ 3. Demonstrate an ability to troubleshoot and maintain a robotics workcell.

STUDENT COMPETENCY PROFILE
FOR
COMMUNICATIONS ELECTRONICS REPAIR TECHNOLOGY

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Satellite Systems (CET 1113)

_____ 1. Identify and describe the basic principles and types of satellite systems.
_____ 2. Install, align, and service satellite systems.

Diagnostics and Troubleshooting Lab (CET 2223)

_____ 1. Service and repair consumer audio electronic devices.
_____ 2. Service and repair other consumer electronic devices.

Video Recording Systems Lab (CET 2323)

_____ 1. Troubleshoot and repair video cassette recorders.
_____ 2. Service, troubleshoot, and repair color video camera/recorder.

Advanced Electronic Communications (CET 2424)

_____ 1. Troubleshoot, service, and repair AM radio systems.
_____ 2. Troubleshoot, service, and repair FM radio systems.
_____ 3. Install and adjust antenna systems and transmission lines.
_____ 4. Explain different types of microwave transmission.
_____ 5. Analyze and demonstrate the characteristics and operation of digital modulation.

Video Systems Repair Lab (CET 2823)

_____ 1. Troubleshoot and repair television receivers.
_____ 2. Adjust and/or align television receivers.

Special Project (CET 291(1-3))

_____ 1. Develop a written plan which details the activities and projects to be completed.
_____ 2. Assess accomplishment of objectives.
_____ 3. Utilize a set of written guidelines for the special project.

Supervised Work Experience (CET 292(1-6))

_____ 1. Apply technical skills needed to be a viable member of the work force.
_____ 2. Apply skills developed in other program area courses.
_____ 3. Apply human relationship skills.
_____ 4. Apply and practice positive work habits and responsibilities.
_____ 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
_____ 6. Assess accomplishment of objectives.
_____ 7. Utilize a set of written guidelines for the Supervised Work Experience.

Fundamentals of Electronics (EET 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environments.
_____ 2. Demonstrate and utilize proper breadboarding techniques.
_____ 3. Demonstrate proficiency in the use of a calculator.
_____ 4. Demonstrate the proper use and operation of test equipment.
_____ 5. Demonstrate proper soldering and desoldering techniques.

DC Circuits (EET 1114)

_____ 1. Demonstrate and apply an understanding of a basic electrical circuit.
_____ 2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.
_____ 3. Analyze and evaluate the parameters of a series circuit.
_____ 4. Analyze and evaluate the parameters of a parallel circuit.
_____ 5. Analyze and evaluate the parameters of a series-parallel circuit.
_____ 6. Apply network theorems to the analysis of complex circuits.
_____ 7. Explain capacitance and demonstrate its application in DC and transient circuits.
_____ 8. Explain inductance and demonstrate its application in DC and transient circuits.

AC Circuits (EET 1123)

_____ 1. Analyze a sine wave and explain its characteristics and application to AC circuits.
_____ 2. Analyze inductive and capacitive reactance in series and parallel circuits.
_____ 3. Analyze transformer voltage, current, impedance transformations, and applications.
_____ 4. Explain RLC non-resonant circuits.
_____ 5. Explain RLC resonant circuits.
_____ 6. Explain and classify filters.

Digital Electronics (EET 1214)

_____ 1. Perform mathematical operations in digital number systems.
_____ 2. Classify logic gates and explain their functions.
_____ 3. Construct and analyze combination logic circuits, including encoders/decoders.
_____ 4. Minimize logic circuits using Boolean algebra and Karnaugh mapping.
_____ 5. Compare and interface logic families and explain specifications of each.
_____ 6. Analyze the flip flop circuits and explain their operations.
_____ 7. Analyze sequential logic circuits and demonstrate the operations of shift registers, counters, and wave form generators.
_____ 8. Explain and demonstrate the principles and operation of multiplexer/demultiplexer circuits display.
_____ 9. Explain and demonstrate the principles and operations of the A/D and D/A digital circuits.
_____ 10. Analyze principles and operations of digital display devices.
_____ 11. Explain the operation of basic memory circuits.

Solid State Devices and Circuits (EET 1314)

_____ 1. Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
_____ 2. Explain semiconductor diode theory and apply to diode circuits.
_____ 3. Analyze the operation of semiconductor special purpose diodes.
_____ 4. Analyze the operation of bipolar junction transistors.
_____ 5. Explain and demonstrate the biasing of a transistor.
_____ 6. Explain and analyze the construction of BJT amplifiers.

_____ 7. Analyze the operation of field effect transistors and demonstrate their applications.

_____ 8. Analyze the operation of thyristors and demonstrate their applications.

Microprocessors (EET 1324)

_____ 1. Demonstrate an understanding of microprocessor structure and terminology.

_____ 2. Analyze the architectural design of microprocessors.

_____ 3. Describe the use of instruction sets and machine codes in operating microprocessors.

_____ 4. Understand principles and operation of types of microprocessor memory circuits.

_____ 5. Develop, execute, and debug microprocessor programs in assembly language.

Drafting for Electronic/Electrical Technology (EET 1713)

_____ 1. Demonstrate an understanding of drafting fundamentals using block, flow and single line diagrams.

_____ 2. Demonstrate an understanding of electronic symbols, components, and references used in schematic and logic diagrams.

_____ 3. Demonstrate an understanding of printed circuitry and packaging drawings.

_____ 4. Demonstrate an understanding of electronics drafting using CAD.

Linear Integrated Circuits (EET 2334)

_____ 1. Analyze and demonstrate the effects of frequency on amplifiers.

_____ 2. Describe the principles, operation, and characteristics of operational amplifier.

_____ 3. Describe and demonstrate the function and operational characteristics of op-amps in linear applications.

_____ 4. Describe and demonstrate the function and operational characteristics of op-amp in non-linear applications.

_____ 5. Describe the function and operating characteristics of voltage regulators.

Electronic Communications (EET 2414)

_____ 1. Explain the operation of the components of a communication system.
_____ 2. Explain and perform signal and noise analysis.
_____ 3. Analyze and demonstrate the characteristics and operation of AM systems.
_____ 4. Analyze and demonstrate the characteristics and operation of FM systems.
_____ 5. Analyze and demonstrate the characteristics and operation of Digital Modulation.
_____ 6. Analyze and explain the characteristics of wave propagation, antennas, and transmission lines.
_____ 7. Analyze and explain one-way and two-way communication.

Fundamentals of Fiber Optics (EET 2423)

_____ 1. Describe history and advantages of fiber optic systems.
_____ 2. Explain the operational and application of optical signal sources.
_____ 3. Explain the operation and application of fiber optic system components.
_____ 4. Explain the theory of light propagation in vacuum and in optical fiber.
_____ 5. Describe properties of different types of optical fibers.

Interfacing Techniques (EET 2514)

_____ 1. Describe Industry Standards for Interfacing.
_____ 2. Identify signals related to parallel and serial ports.
_____ 3. Describe interfacing requirements of computer peripherals.
_____ 4. Describe special purpose large scale integration devices.
_____ 5. Explain and demonstrate methods for converting physical variables.
_____ 6. Use microprocessor to evaluate data as a result of physical variables taking place.

Video Systems (EET 2813)

_____ 1. Describe the process of television broadcasting fundamentals.
_____ 2. Explain the basic function of a TV receiver.
_____ 3. Describe and demonstrate safety hazards of working with video systems.
_____ 4. Analyze the functions of each block in a color TV receiver.

5. Explain the principles of computer logic applied to TV for producing special effects.
6. Analyze the fundamental operations of a video display system.
7. Analyze the operation of a video generating system.
8. Analyze the operation of a video storage system.

STUDENT COMPETENCY PROFILE FOR COMPUTER SERVICING TECHNOLOGY

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Failure Analysis (CST 1213)

_____ 1. Explain the different modes of failure.
_____ 2. Explain methods of failure analysis.
_____ 3. Analyze failure in an analog and digital system.
_____ 4. Run performance tests using the system specifications.
_____ 5. Explain reliability evaluations and how they relate to system failures.
_____ 6. Describe analysis procedures in the case of complete system failure.
_____ 7. Explain the role of quality assurance personnel by job and function.
_____ 8. Maintain an engineering notebook with sufficient accuracy to justify failure analysis methods.

Computer Servicing Lab I (CST 2113)

_____ 1. Complete maintenance documentation.
_____ 2. Explain anti-static control procedures and equipment for computer repair.
_____ 3. Set up soldering and desoldering station using correct safety procedures.
_____ 4. Identify tools needed for basic computer servicing.
_____ 5. Identify the following test equipment:
_____ 6. Demonstrate repair procedures for disassembly and reassembly.
_____ 7. Remove and install electronic components.
_____ 8. Run performance tests on computers and equipment.
_____ 9. Build and test cables.
_____ 10. Run diagnostic software.
_____ 11. Utilize schematics and troubleshooting procedures.
_____ 12. Isolate malfunction to section, card, and component.

_____ 13. Demonstrate the following troubleshooting techniques used in environment investigation to localize problem.

Computer Servicing Lab II (CST 2123)

_____ 1. Maintain service log on individual pieces of equipment.
_____ 2. Service and align computers and equipment.
_____ 3. Service peripherals and components.
_____ 4. Replace ribbons and filters.
_____ 5. Service/replace computer components to include running diagnostic software, observing failure symptoms, disassembly and reassembly, and observing anti-static procedures.

Special Project (CST 291(1-3))

_____ 1. Develop a written plan which details the activities and projects to be completed.
_____ 2. Assess accomplishment of objectives.
_____ 3. Utilize a set of written guidelines for the special project.

Supervised Work Experience (CST 292(1-6))

_____ 1. Apply technical skills needed to be a viable member of the work force.
_____ 2. Apply skills developed in other program area courses.
_____ 3. Apply human relationship skills.
_____ 4. Apply and practice positive work habits and responsibilities.
_____ 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
_____ 6. Assess accomplishment of objectives.
_____ 7. Utilize a set of written guidelines for the Supervised Work Experience.

Fundamentals of Electronics (EET 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environments.
_____ 2. Demonstrate and utilize proper breadboarding techniques.
_____ 3. Demonstrate proficiency in the use of a calculator.
_____ 4. Demonstrate the proper use and operation of test equipment.
_____ 5. Demonstrate proper soldering and desoldering techniques.

DC Circuits (EET 1114)

_____ 1. Demonstrate and apply an understanding of a basic electrical circuit.
_____ 2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.
_____ 3. Analyze and evaluate the parameters of a series circuit.
_____ 4. Analyze and evaluate the parameters of a parallel circuit.
_____ 5. Analyze and evaluate the parameters of a series-parallel circuit.
_____ 6. Apply network theorems to the analysis of complex circuits.
_____ 7. Explain capacitance and demonstrate its application in DC and transient circuits.
_____ 8. Explain inductance and demonstrate its application in DC and transient circuits.

AC Circuits (EET 1123)

_____ 1. Analyze a sine wave and explain its characteristics and application to AC circuits.
_____ 2. Analyze inductive and capacitive reactance in series and parallel circuits.
_____ 3. Analyze transformer voltage, current, impedance transformations, and applications.
_____ 4. Explain RLC non-resonant circuits.
_____ 5. Explain RLC resonant circuits.
_____ 6. Explain and classify filters.

Digital Electronics (EET 1214)

_____ 1. Perform mathematical operations in digital number systems.
_____ 2. Classify logic gates and explain their functions.
_____ 3. Construct and analyze combination logic circuits, including encoders/decoders.
_____ 4. Minimize logic circuits using Boolean algebra and Karnaugh mapping.
_____ 5. Compare and interface logic families and explain specifications of each.
_____ 6. Analyze the flip flop circuits and explain their operations.
_____ 7 Analyze sequential logic circuits and demonstrate the operations of shift registers, counters, and wave form generators.
_____ 8. Explain and demonstrate the principles and operation of multiplexer demultiplexer circuits display.

_____ 9. Explain and demonstrate the principles and operations of the A/D and D/A digital circuits.
_____ 10. Analyze principles and operations of digital display devices.
_____ 11. Explain the operation of basic memory circuits.

Solid State Devices and Circuits (EET 1314)

_____ 1. Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
_____ 2. Explain semiconductor diode theory and apply to diode circuits.
_____ 3. Analyze the operation of semiconductor special purpose diodes.
_____ 4. Analyze the operation of bipolar junction transistors.
_____ 5. Explain and demonstrate the biasing of a transistor.
_____ 6. Explain and analyze the construction of BJT amplifiers.
_____ 7. Analyze the operation of field effect transistors and demonstrate their applications.
_____ 8. Analyze the operation of thyristors and demonstrate their applications.

Microprocessors (EET 1324)

_____ 1. Demonstrate an understanding of microprocessor structure and terminology.
_____ 2. Analyze the architectural design of microprocessors.
_____ 3. Describe the use of instruction sets and machine codes in operating microprocessors.
_____ 4. Understand principles and operation of types of microprocessor memory circuits.
_____ 5. Develop, execute, and debug microprocessor programs in assembly language.

Computer Fundamentals for Electronics/Electricity (EET 1613)

_____ 1. Demonstrate the essentials of microcomputer components.
_____ 2. Demonstrate an understanding of essential microcomputer peripherals.
_____ 3. Demonstrate an understanding of essential microcomputer operating systems.
_____ 4. Demonstrate an understanding of essential microcomputer architecture.
_____ 5. Create a batch file.
_____ 6. Use editing, debugging techniques.
_____ 7. Set up and configure a microcomputer using operating system.
_____ 8. Demonstrate competency with a graphic operating system.

Drafting for Electronic/Electrical Technology (EET 1713)

_____ 1. Demonstrate an understanding of drafting fundamentals using block, flow and single line diagrams.
_____ 2. Demonstrate an understanding of electronic symbols, components, and references used in schematic and logic diagrams.
_____ 3. Demonstrate an understanding of printed circuitry and packaging drawings.
_____ 4. Demonstrate an understanding of electronics drafting using CAD.

Linear Integrated Circuits (EET 2334)

_____ 1. Analyze and demonstrate the effects of frequency on amplifiers.
_____ 2. Describe the principles, operation, and characteristics of operational amplifier.
_____ 3. Describe and demonstrate the function and operational characteristics of op-amps in linear applications.
_____ 4. Describe and demonstrate the function and operational characteristics of op-amp in non-linear applications.
_____ 5. Describe the function and operating characteristics of voltage regulators.

Interfacing Techniques (EET 2514)

_____ 1. Describe Industry Standards for Interfacing.
_____ 2. Identify signals related to parallel and serial ports.
_____ 3. Describe interfacing requirements of computer peripherals.
_____ 4. Describe special purpose large scale integration devices.
_____ 5. Explain and demonstrate methods for converting physical variables.
_____ 6. Use microprocessor to evaluate data as a result of physical variables taking place.

Video Systems (EET 2813)

_____ 1. Describe the process of television broadcasting fundamentals.
_____ 2. Explain the basic function of a TV receiver.
_____ 3. Describe and demonstrate safety hazards of working with video systems.
_____ 4. Analyze the functions of each block in a color TV receiver.
_____ 5. Explain the principles of computer logic applied to TV for producing special effects.

_____ 6. Analyze the fundamental operations of a video display system.
_____ 7. Analyze the operation of a video generating system.
_____ 8. Analyze the operation of a video storage system.

STUDENT COMPETENCY PROFILE FOR ELECTRICAL TECHNOLOGY

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Fundamentals of Electricity (ELT 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environment.
_____ 2. Identify, demonstrate, and utilize electrical tools, equipment, and references.
_____ 3. Identify and solve problems relating to Ohm's Law, DC, and AC circuits.
_____ 4. Identify, list, and distinguish between over current protective devices, load centers, and safety switches.

Residential/Light Commercial Wiring (ELT 1113)

_____ 1. Demonstrate the ability to read and utilize drawings of a structure.
_____ 2. Demonstrate the ability to wire a mock-up of a residence/commercial building.

Commercial and Industrial Wiring (ELT 1123)

_____ 1. Demonstrate the ability to apply general safety rules.
_____ 2. Demonstrate the ability to install and maintain raceways, conduit, and fittings.
_____ 3. Demonstrate the installation of different types of three-phase service entrances, metering devices, main panels, raceways or ducts, subpanels, feeder circuits, and branch circuits according to electrical codes.
_____ 4. Develop a cost estimate for a job to include supplies and labor costs.

Electrical Power (ELT 1213)

_____ 1. Identify and describe safety and environmental protection concerns associated with electrical power equipment.
_____ 2. Demonstrate the ability of working with single-phase electrical components.
_____ 3. Demonstrate the ability of working with three-phase electrical components.
_____ 4. Demonstrate the ability to work with DC electrical components.
_____ 5. Describe the process of synchronizing two alternators.

Motor Maintenance and Troubleshooting (ELT 1223)

_____ 1. Demonstrate the ability to apply general safety and safety requirements for working around electric motors.
_____ 2. Apply the principles of the use of instruments and tools in maintaining, troubleshooting, and operating electrical motors.
_____ 3. List and describe functions of electric motors.

Branch Circuit and Service Entrance Calculations (ELT 1253)

_____ 1. Explain the sizing and color of equipment grounding conductors for all branch circuits.
_____ 2. Explain and demonstrate the method of determining the minimum number of general purpose branch circuits needed in a residential structure.
_____ 3. Explain and demonstrate the procedure for calculating the branch circuit sizes for individual branch circuits for residential wiring.
_____ 4. Explain and demonstrate the procedure for calculating the minimum number of branch circuits of the small appliance and laundry types.
_____ 5. Explain and demonstrate the procedure for calculating the residential service entrance conductor size using the optional method NEC 220, Section C.

Blueprint Reading/Planning the Residential Installation (ELT 1263)

_____ 1. Explain the ANSI symbols that are used in blueprint reading.
_____ 2. Explain the various plans and elevations critical to blueprint reading.
_____ 3. Use the exterior elevations to determine service entrance locations and heights.

_____ 4. Demonstrate the use of interior elevations to properly locate vertical wall receptacles, switches, and lighting outlets.

_____ 5. Demonstrate the ability to prepare a blueprint to meet the NEC minimum requirements.

Switching Circuits for Residential, Commercial, and Industrial Application (ELT 1273)

_____ 1. Explain and demonstrate how to move various switching circuits.

_____ 2. Explain and demonstrate the methods for low voltage remote and relay control wiring.

Estimating the Cost of a Residential Installation (ELT 1283)

_____ 1. Develop and complete an estimating form to determine the total projected cost of materials and labor by using the results of a time and motion study, actual cost of materials, and margin of profit.

_____ 2. Develop a branch circuit schedule for a residence.

Motor Control Systems (ELT 1413)

_____ 1. Demonstrate the ability to install and troubleshoot different control circuits and devices.

Solid State Motor Control (ELT 2424)

_____ 1. Demonstrate the ability to apply general safety and safety requirements for working on and around electrical motors.

_____ 2. Demonstrate the principles of solid state motor controls.

_____ 3. Demonstrate the ability to discuss and operate AC and DC variable speed drives.

Programmable Logic Controllers (ELT 2613)

_____ 1. Describe the principles of PLC's.

_____ 2. Utilize the different types of PLC hardware.

_____ 3. Demonstrate mastery of numbering systems, encoding/decoding, logical operations, and Boolean expressions.

_____ 4. Demonstrate the ability to program all types of internal and discrete instructions.

_____ 5. Demonstrate the ability to troubleshoot and maintain different programmable controllers systems.

Special Project (ELT 291(1-3))

_____ 1. Develop a written plan and blueprints which details the activities and projects to be completed.
_____ 2. Assess accomplishment of objectives.
_____ 3. Utilize a set of written guidelines for the special project.

Supervised Work Experience (ELT 292(1-6))

_____ 1. Apply technical skills needed to be a viable member of the work force.
_____ 2. Apply skills developed in other program area courses.
_____ 3. Apply human relationship skills.
_____ 4. Apply and practice positive work habits and responsibilities.
_____ 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
_____ 6. Assess accomplishment of objectives.
_____ 7. Utilize a set of written guidelines for the Supervised Work Experience.

DC Circuits (EET 1114)

_____ 1. Demonstrate and apply an understanding of a basic electrical circuit.
_____ 2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.
_____ 3. Analyze and evaluate the parameters of a series circuit.
_____ 4. Analyze and evaluate the parameters of a parallel circuit.
_____ 5. Analyze and evaluate the parameters of a series-parallel circuit.
_____ 6. Apply network theorems to the analysis of complex circuits.
_____ 7. Explain capacitance and demonstrate its application in DC and transient circuits.
_____ 8. Explain inductance and demonstrate its application in DC and transient circuits.

AC Circuits (EET 1123)

_____ 1. Analyze a sine wave and explain its characteristics and application to AC circuits.
_____ 2. Analyze inductive and capacitive reactance in series and parallel circuits.
_____ 3. Analyze transformer voltage, current, impedance transformations, and applications.

_____ 4. Explain RLC non-resonant circuits.
_____ 5. Explain RLC resonant circuits.
_____ 6. Explain and classify filters.

Solid State Devices and Circuits (EET 1314)

_____ 1. Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
_____ 2. Explain semiconductor diode theory and apply to diode circuits.
_____ 3. Analyze the operation of semiconductor special purpose diodes.
_____ 4. Analyze the operation of bipolar junction transistors.
_____ 5. Explain and demonstrate the biasing of a transistor.
_____ 6. Explain and analyze the construction of BJT amplifiers.
_____ 7. Analyze the operation of field effect transistors and demonstrate their applications.
_____ 8. Analyze the operation of thyristors and demonstrate their applications.

Computer Fundamentals for Electronics/Electricity (EET 1613)

_____ 1. Demonstrate the essentials of microcomputer components.
_____ 2. Demonstrate an understanding of essential microcomputer peripherals.
_____ 3. Demonstrate an understanding of essential microcomputer operating systems.
_____ 4. Demonstrate an understanding of essential microcomputer architecture.
_____ 5. Create a batch file.
_____ 6. Use editing, debugging techniques.
_____ 7. Set up and configure a microcomputer using operating system.
_____ 8. Demonstrate competency with a graphic operating system.

Drafting for Electronic/Electrical Technology (EET 1713)

_____ 1. Demonstrate an understanding of drafting fundamentals using block, flow and single line diagrams.
_____ 2. Demonstrate an understanding of electronic symbols, components, and references used in schematic and logic diagrams.
_____ 3. Demonstrate an understanding of printed circuitry and packaging drawings.
_____ 4. Demonstrate an understanding of electronics drafting using CAD.

Fundamentals of Fiber Optics (EET 2423)

_____ 1. Describe history and advantages of fiber optic systems.
_____ 2. Explain the operational and application of optical signal sources.
_____ 3. Explain the operation and application of fiber optic system components.
_____ 4. Explain the theory of light propagation in vacuum and in optical fiber.
_____ 5. Describe properties of different types of optical fibers.

STUDENT COMPETENCY PROFILE FOR ELECTRONICS TECHNOLOGY

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Systems Programming I (MFT 1123)

_____ 1. Demonstrate the capability to install software.
_____ 2. Develop and use programming fundamentals.
_____ 3. Develop program techniques.

Computer Servicing Lab I (CST 2113)

_____ 1. Complete maintenance documentation.
_____ 2. Explain anti-static control procedures and equipment for computer repair.
_____ 3. Set up soldering and desoldering station using correct safety procedures.
_____ 4. Identify tools needed for basic computer servicing.
_____ 5. Identify the following test equipment:
_____ 6. Demonstrate repair procedures for disassembly and reassembly.
_____ 7. Remove and install electronic components.
_____ 8. Run performance tests on computers and equipment.
_____ 9. Build and test cables.
_____ 10. Run diagnostic software.
_____ 11. Utilize schematics and troubleshooting procedures.
_____ 12. Isolate malfunction to section, card, and component.
_____ 13. Demonstrate the following troubleshooting techniques used in environment investigation to localize problem.

Computer Servicing Lab II (CST 2123)

_____ 1. Maintain service log on individual pieces of equipment.
_____ 2. Service and align computers and equipment.
_____ 3. Service peripherals and components.
_____ 4. Replace ribbons and filters.

_____ 5. Service/replace computer components to include running diagnostic software, observing failure symptoms, disassembly and reassembly, and observing anti-static procedures.

Commercial and Industrial Wiring (ELT 1123)

_____ 1. Demonstrate the ability to apply general safety rules.
_____ 2. Demonstrate the ability to install and maintain raceways, conduit, and fittings.
_____ 3. Demonstrate the installation of different types of three-phase service entrances, metering devices, main panels, raceways or ducts, subpanels, feeder circuits, and branch circuits according to electrical codes.
_____ 4. Develop a cost estimate for a job to include supplies and labor costs.

Electrical Power (ELT 1213)

_____ 1. Identify and describe safety and environmental protection concerns associated with electrical power equipment.
_____ 2. Demonstrate the ability of working with single-phase electrical components.
_____ 3. Demonstrate the ability of working with three-phase electrical components.
_____ 4. Demonstrate the ability to work with DC electrical components.
_____ 5. Describe the process of synchronizing two alternators.

Motor Maintenance and Troubleshooting (ELT 1223)

_____ 1. Demonstrate the ability to apply general safety and safety requirements for working around electric motors.
_____ 2. Apply the principles of the use of instruments and tools in maintaining, troubleshooting, and operating electrical motors.
_____ 3. List and describe functions of electric motors.

Motor Control Systems (ELT 1413)

_____ 1. Demonstrate the ability to install and troubleshoot different control circuits and devices.

Solid State Motor Control (ELT 2424)

_____ 1. Demonstrate the ability to apply general safety and safety requirements for working on and around electrical motors.

_____ 2. Demonstrate the principles of solid state motor controls.
_____ 3. Demonstrate the ability to discuss and operate AC and DC variable speed drives.

Programmable Logic Controllers (ELT 2613)

_____ 1. Describe the principles of PLC's.
_____ 2. Utilize the different types of PLC hardware.
_____ 3. Demonstrate mastery of numbering systems, encoding/decoding, logical operations, and Boolean expressions.
_____ 4. Demonstrate the ability to program all types of internal and discrete instructions.
_____ 5. Demonstrate the ability to troubleshoot and maintain different programmable controllers systems.

Fundamentals of Electronics (EET 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environments.
_____ 2. Demonstrate and utilize proper breadboarding techniques.
_____ 3. Demonstrate proficiency in the use of a calculator.
_____ 4. Demonstrate the proper use and operation of test equipment.
_____ 5. Demonstrate proper soldering and desoldering techniques.

DC Circuits (EET 1114)

_____ 1. Demonstrate and apply an understanding of a basic electrical circuit.
_____ 2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.
_____ 3. Analyze and evaluate the parameters of a series circuit.
_____ 4. Analyze and evaluate the parameters of a parallel circuit.
_____ 5. Analyze and evaluate the parameters of a series-parallel circuit.
_____ 6. Apply network theorems to the analysis of complex circuits.
_____ 7. Explain capacitance and demonstrate its application in DC and transient circuits.
_____ 8. Explain inductance and demonstrate its application in DC and transient circuits.

AC Circuits (EET 1123)

_____ 1. Analyze a sine wave and explain its characteristics and application to AC circuits.

_____ 2. Analyze inductive and capacitive reactance in series and parallel circuits.
_____ 3. Analyze transformer voltage, current, impedance transformations, and applications.
_____ 4. Explain RLC non-resonant circuits.
_____ 5. Explain RLC resonant circuits.
_____ 6. Explain and classify filters.

Digital Electronics (EET 1214)

_____ 1. Perform mathematical operations in digital number systems.
_____ 2. Classify logic gates and explain their functions.
_____ 3. Construct and analyze combination logic circuits, including encoders/decoders.
_____ 4. Minimize logic circuits using Boolean algebra and Karnaugh mapping.
_____ 5. Compare and interface logic families and explain specifications of each.
_____ 6. Analyze the flip flop circuits and explain their operations.
_____ 7. Analyze sequential logic circuits and demonstrate the operations of shift registers, counters, and wave form generators.
_____ 8. Explain and demonstrate the principles and operation of multiplexer/demultiplexer circuits display.
_____ 9. Explain and demonstrate the principles and operations of the A/D and D/A digital circuits.
_____ 10. Analyze principles and operations of digital display devices.
_____ 11. Explain the operation of basic memory circuits.

Solid State Devices and Circuits (EET 1314)

_____ 1. Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
_____ 2. Explain semiconductor diode theory and apply to diode circuits.
_____ 3. Analyze the operation of semiconductor special purpose diodes.
_____ 4. Analyze the operation of bipolar junction transistors.
_____ 5. Explain and demonstrate the biasing of a transistor.
_____ 6. Explain and analyze the construction of BJT amplifiers.
_____ 7. Analyze the operation of field effect transistors and demonstrate their applications.
_____ 8. Analyze the operation of thyristors and demonstrate their applications.

Microprocessors (EET 1324)

_____ 1. Demonstrate an understanding of microprocessor structure and terminology.
_____ 2. Analyze the architectural design of microprocessors.
_____ 3. Describe the use of instruction sets and machine codes in operating microprocessors.
_____ 4. Understand principles and operation of types of microprocessor memory circuits.
_____ 5. Develop, execute, and debug microprocessor programs in assembly language.

Computer Fundamentals for Electronics/Electricity (EET 1613)

_____ 1. Demonstrate the essentials of microcomputer components.
_____ 2. Demonstrate an understanding of essential microcomputer peripherals.
_____ 3. Demonstrate an understanding of essential microcomputer operating systems.
_____ 4. Demonstrate an understanding of essential microcomputer architecture.
_____ 5. Create a batch file.
_____ 6. Use editing, debugging techniques.
_____ 7. Set up and configure a microcomputer using operating system.
_____ 8. Demonstrate competency with a graphic operating system.

Drafting for Electronic/Electrical Technology (EET 1713)

_____ 1. Demonstrate an understanding of drafting fundamentals using block, flow and single line diagrams.
_____ 2. Demonstrate an understanding of electronic symbols, components, and references used in schematic and logic diagrams.
_____ 3. Demonstrate an understanding of printed circuitry and packaging drawings.
_____ 4. Demonstrate an understanding of electronics drafting using CAD.

Linear Integrated Circuits (EET 2334)

_____ 1. Analyze and demonstrate the effects of frequency on amplifiers.
_____ 2. Describe the principles, operation, and characteristics of operational amplifier

_____ 3. Describe and demonstrate the function and operational characteristics of op-amps in linear applications.
_____ 4. Describe and demonstrate the function and operational characteristics of op-amp in non-linear applications.
_____ 5. Describe the function and operating characteristics of voltage regulators.

Electronic Communications (EET 2414)

_____ 1. Explain the operation of the components of a communication system.
_____ 2. Explain and perform signal and noise analysis.
_____ 3. Analyze and demonstrate the characteristics and operation of AM systems.
_____ 4. Analyze and demonstrate the characteristics and operation of FM systems.
_____ 5. Analyze and demonstrate the characteristics and operation of Digital Modulation.
_____ 6. Analyze and explain the characteristics of wave propagation, antennas, and transmission lines.
_____ 7. Analyze and explain one-way and two-way communication.

Fundamentals of Fiber Optics (EET 2423)

_____ 1. Describe history and advantages of fiber optic systems.
_____ 2. Explain the operational and application of optical signal sources.
_____ 3. Explain the operation and application of fiber optic system components.
_____ 4. Explain the theory of light propagation in vacuum and in optical fiber.
_____ 5. Describe properties of different types of optical fibers.

Interfacing Techniques (EET 2514)

_____ 1. Describe Industry Standards for Interfacing.
_____ 2. Identify signals related to parallel and serial ports.
_____ 3. Describe interfacing requirements of computer peripherals.
_____ 4. Describe special purpose large scale integration devices.
_____ 5. Explain and demonstrate methods for converting physical variables.
_____ 6. Use microprocessor to evaluate data as a result of physical variables taking place.

Video Systems (EET 2813)

_____ 1. Describe the process of television broadcasting fundamentals.
_____ 2. Explain the basic function of a TV receiver.
_____ 3. Describe and demonstrate safety hazards of working with video systems.
_____ 4. Analyze the functions of each block in a color TV receiver.
_____ 5. Explain the principles of computer logic applied to TV for producing special effects.
_____ 6. Analyze the fundamental operations of a video display system.
_____ 7. Analyze the operation of a video generating system.
_____ 8. Analyze the operation of a video storage system.

Special Project (EET 291(1-3))

_____ 1. Develop a written plan which details the activities and projects to be completed.
_____ 2. Assess accomplishment of objectives.
_____ 3. Utilize a set of written guidelines for the special project.

Supervised Work Experience (EET 292(1-6))

_____ 1. Apply technical skills needed to be a viable member of the work force.
_____ 2. Apply skills developed in other program area courses.
_____ 3. Apply human relationship skills.
_____ 4. Apply and practice positive work habits and responsibilities.
_____ 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
_____ 6. Assess accomplishment of objectives.
_____ 7. Utilize a set of written guidelines for the Supervised Work Experience.

Fluid Power (INT 1214)

_____ 1. Define and describe basic laws governing fluids.
_____ 2. Identify and draw symbols for hydraulics and pneumatics.
_____ 3. Describe operation and nomenclature of various pumps and compressors.
_____ 4. Explain fluids as pertaining to the transmission of energy.
_____ 5. Describe the operation of flow, pressure, and directional control valves.
_____ 6. Explain the types of actuators used in pneumatics and hydraulics.

_____ 7. Explain, construct, and troubleshoot various hydraulic and pneumatic circuits.
_____ 8. Demonstrate the use of electro-mechanical controls in hydraulic and pneumatic circuits.

Fundamentals of Robotics (ROT 1113)

_____ 1. Describe the various major components of all robots.
_____ 2. Demonstrate safety procedures used in the automated environment.
_____ 3. Demonstrate the ability to operate robots.

Industrial Hydraulics (ROT 1213)

_____ 1. Define and describe basic laws governing liquids.
_____ 2. Identify and draw symbols for hydraulics.
_____ 3. Describe operation and nomenclature of various pumps.
_____ 4. Explain liquids as pertaining to the transmission of energy.
_____ 5. Describe the operation of flow, pressure, and directional control valves.
_____ 6. Explain the types of actuators used in hydraulics.
_____ 7. Explain, construct, and troubleshoot various hydraulic circuits.

Industrial Pneumatics (ROT 1223)

_____ 1. Define and describe basic laws governing gases
_____ 2. Identify and draw symbols for pneumatics.
_____ 3. Describe the operation and nomenclature of various compressors.
_____ 4. Explain fluids as pertaining to the transmission of energy.
_____ 5. Describe the operation of flow, pressure, and directional control valves.
_____ 6. Explain the types of actuators used in pneumatics.
_____ 7. Explain, construct, and troubleshoot various pneumatic circuits.
_____ 8. Demonstrate the use of electro-mechanical controls in hydraulic and pneumatic circuits.

STUDENT COMPETENCY PROFILE FOR INSTRUMENTATION TECHNOLOGY

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Principles of Automation I (MFT 1214)

_____ 1. Demonstrate safety procedures.
_____ 2. Describe and explain the characteristics and applications of solid state devices used in control systems.
_____ 3. Demonstrate the ability to troubleshoot a power supply.
_____ 4. Explain the application of the operation of operational amplifiers.
_____ 5. Explain the theory of operation of AC/DC motors, tachometers, optical encoders, servos, resolvers, and stepped motors.
_____ 6. Explain the principles of the operation of mechanical drives.
_____ 7. Apply the fundamental principles of digital principles.

Motor Control Systems (ELT 1413)

_____ 1. Demonstrate the ability to install and troubleshoot different control circuits and devices.

Solid State Motor Control (ELT 2424)

_____ 1. Demonstrate the ability to apply general safety and safety requirements for working on and around electrical motors.
_____ 2. Demonstrate the principles of solid state motor controls.
_____ 3. Demonstrate the ability to discuss and operate AC and DC variable speed drives.

Programmable Logic Controllers (ELT 2613)

_____ 1 Describe the principles of PLC's.
_____ 2 Utilize the different types of PLC hardware.
_____ 3 Demonstrate mastery of numbering systems, encoding decoding, logical operations, and Boolean expressions.

_____ 4. Demonstrate the ability to program all types of internal and discrete instructions.

_____ 5. Demonstrate the ability to troubleshoot and maintain different programmable controllers systems.

Fundamentals of Electronics (EET 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environments.

_____ 2. Demonstrate and utilize proper breadboarding techniques.

_____ 3. Demonstrate proficiency in the use of a calculator.

_____ 4. Demonstrate the proper use and operation of test equipment.

_____ 5. Demonstrate proper soldering and desoldering techniques.

DC Circuits (EET 1114)

_____ 1. Demonstrate and apply an understanding of a basic electrical circuit.

_____ 2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.

_____ 3. Analyze and evaluate the parameters of a series circuit.

_____ 4. Analyze and evaluate the parameters of a parallel circuit.

_____ 5. Analyze and evaluate the parameters of a series-parallel circuit.

_____ 6. Apply network theorems to the analysis of complex circuits.

_____ 7. Explain capacitance and demonstrate its application in DC and transient circuits.

_____ 8. Explain inductance and demonstrate its application in DC and transient circuits.

AC Circuits (EET 1123)

_____ 1. Analyze a sine wave and explain its characteristics and application to AC circuits.

_____ 2. Analyze inductive and capacitive reactance in series and parallel circuits.

_____ 3. Analyze transformer voltage, current, impedance transformations, and applications.

_____ 4. Explain RLC non-resonant circuits.

_____ 5. Explain RLC resonant circuits.

_____ 6. Explain and classify filters.

Digital Electronics (EET 1214)

_____ 1. Perform mathematical operations in digital number systems.
_____ 2. Classify logic gates and explain their functions.
_____ 3. Construct and analyze combination logic circuits, including encoders/decoders.
_____ 4. Minimize logic circuits using Boolean algebra and Karnaugh mapping.
_____ 5. Compare and interface logic families and explain specifications of each.
_____ 6. Analyze the flip flop circuits and explain their operations.
_____ 7. Analyze sequential logic circuits and demonstrate the operations of shift registers, counters, and wave form generators.
_____ 8. Explain and demonstrate the principles and operation of multiplexer/demultiplexer circuits display.
_____ 9. Explain and demonstrate the principles and operations of the A/D and D/A digital circuits.
_____ 10. Analyze principles and operations of digital display devices.
_____ 11. Explain the operation of basic memory circuits.

Solid State Devices and Circuits (EET 1314)

_____ 1. Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
_____ 2. Explain semiconductor diode theory and apply to diode circuits.
_____ 3. Analyze the operation of semiconductor special purpose diodes.
_____ 4. Analyze the operation of bipolar junction transistors.
_____ 5. Explain and demonstrate the biasing of a transistor.
_____ 6. Explain and analyze the construction of BJT amplifiers.
_____ 7. Analyze the operation of field effect transistors and demonstrate their applications.
_____ 8. Analyze the operation of thyristors and demonstrate their applications.

Computer Fundamentals for Electronics/Electricity (EET 1613)

_____ 1. Demonstrate the essentials of microcomputer components.
_____ 2. Demonstrate an understanding of essential microcomputer peripherals.
_____ 3. Demonstrate an understanding of essential microcomputer operating systems.
_____ 4. Demonstrate an understanding of essential microcomputer architecture.
_____ 5. Create a batch file.

_____ 6. Use editing, debugging techniques.
_____ 7. Set up and configure a microcomputer using operating system.
_____ 8. Demonstrate competency with a graphic operating system.

Drafting for Electronic/Electrical Technology (EET 1713)

_____ 1. Demonstrate an understanding of drafting fundamentals using block, flow and single line diagrams.
_____ 2. Demonstrate an understanding of electronic symbols, components, and references used in schematic and logic diagrams.
_____ 3. Demonstrate an understanding of printed circuitry and packaging drawings.
_____ 4. Demonstrate an understanding of electronics drafting using CAD.

Linear Integrated Circuits (EET 2334)

_____ 1. Analyze and demonstrate the effects of frequency on amplifiers.
_____ 2. Describe the principles, operation, and characteristics of operational amplifier.
_____ 3. Describe and demonstrate the function and operational characteristics of op-amps in linear applications.
_____ 4. Describe and demonstrate the function and operational characteristics of op-amp in non-linear applications.
_____ 5. Describe the function and operating characteristics of voltage regulators.

Fundamentals of Fiber Optics (EET 2423)

_____ 1. Describe history and advantages of fiber optic systems.
_____ 2. Explain the operational and application of optical signal sources.
_____ 3. Explain the operation and application of fiber optic system components.
_____ 4. Explain the theory of light propagation in vacuum and in optical fiber.
_____ 5. Describe properties of different types of optical fibers.

Fundamentals of Instrumentation (INT 1113)

_____ 1. Demonstrate a working knowledge of instrumentation.
_____ 2. Identify the type of instrumentation input and output devices and describe their applications.
_____ 3. Identify the types of signals used in instrumentation.

_____ 4. Describe fundamentals of process controls.
_____ 5. Design a preventative maintenance program for instrumentation systems.

Fluid Power (INT 1214)

_____ 1. Define and describe basic laws governing fluids.
_____ 2. Identify and draw symbols for hydraulics and pneumatics.
_____ 3. Describe operation and nomenclature of various pumps and compressors.
_____ 4. Explain fluids as pertaining to the transmission of energy.
_____ 5. Describe the operation of flow, pressure, and directional control valves.
_____ 6. Explain the types of actuators used in pneumatics and hydraulics.
_____ 7. Explain, construct, and troubleshoot various hydraulic and pneumatic circuits.
_____ 8. Demonstrate the use of electro-mechanical controls in hydraulic and pneumatic circuits.

Control Systems I (INT 2114)

_____ 1. Explain and apply basic safety regulations which must be followed.
_____ 2. Describe and discuss temperature measurement devices.
_____ 3. Describe and discuss pressure measurement devices.
_____ 4. Describe and discuss level measurement devices and their use.
_____ 5. Describe flow measurement devices and their use.
_____ 6. Describe senors used in process analysis.
_____ 7. Describe information transmission pertaining to process control.

Control Systems II (INT 2124)

_____ 1. Identify and describe parameters and variables of an operational process control system.
_____ 2. Describe control valve characteristics.
_____ 3. Describe various modes of process control.
_____ 4. Describe advanced control methods.
_____ 5. Troubleshoot process control loops.
_____ 6. Demonstrate procedures for handling, storing, and disposing of hazardous materials.

Calibration and Measurement Principles (INT 2214)

_____ 1. Define terms associated with measurement and calibration procedures.
_____ 2. Describe a standard calibration procedure.
_____ 3. Describe and perform specialized calibrations of differential pressure (DP) cells.
_____ 4. Describe and demonstrate Statistical Process Control (SPC).

Special Project (INT 291(1-3))

_____ 1. Develop a written plan which details the activities and projects to be completed.
_____ 2. Assess accomplishment of objectives.
_____ 3. Utilize a set of written guidelines for the special project.

Supervised Work Experience (INT 292(1-6))

_____ 1. Apply technical skills needed to be a viable member of the work force.
_____ 2. Apply skills developed in other program area courses.
_____ 3. Apply human relationship skills.
_____ 4. Apply and practice positive work habits and responsibilities.
_____ 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
_____ 6. Assess accomplishment of objectives.
_____ 7. Utilize a set of written guidelines for the Supervised Work Experience.

Fundamentals of Robotics (ROT 1113)

_____ 1. Describe the various major components of all robots.
_____ 2. Demonstrate safety procedures used in the automated environment.
_____ 3. Demonstrate the ability to operate robots.

Industrial Robotics (ROT 1313)

_____ 1. Demonstrate an ability to integrate a robot into a process.
_____ 2. Demonstrate an ability to integrate peripheral equipment.
_____ 3. Demonstrate an ability to troubleshoot and maintain a robotics workcell

STUDENT COMPETENCY PROFILE
FOR
ROBOTICS TECHNOLOGY

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Systems Programming I (MFT 1123)

_____ 1. Demonstrate the capability to install software.
_____ 2. Develop and use programming fundamentals.
_____ 3. Develop program techniques.

Fundamentals of Electricity (ELT 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environment.
_____ 2. Identify, demonstrate, and utilize electrical tools, equipment, and references.
_____ 3. Identify and solve problems relating to Ohm's Law, DC, and AC circuits.
_____ 4. Identify, list, and distinguish between over current protective devices, load centers, and safety switches.

Commercial and Industrial Wiring (ELT 1123)

_____ 1. Demonstrate the ability to apply general safety rules.
_____ 2. Demonstrate the ability to install and maintain raceways, conduit, and fittings.
_____ 3. Demonstrate the installation of different types of three-phase service entrances, metering devices, main panels, raceways or ducts, subpanels, feeder circuits, and branch circuits according to electrical codes.
_____ 4. Develop a cost estimate for a job to include supplies and labor costs.

Electrical Power (ELT 1213)

_____ 1. Identify and describe safety and environmental protection concerns associated with electrical power equipment.
_____ 2. Demonstrate the ability of working with single-phase electrical components.
_____ 3. Demonstrate the ability of working with three-phase electrical components.
_____ 4. Demonstrate the ability to work with DC electrical components.
_____ 5. Describe the process of synchronizing two alternators.

Motor Maintenance and Troubleshooting (ELT 1223)

_____ 1. Demonstrate the ability to apply general safety and safety requirements for working around electric motors.
_____ 2. Apply the principles of the use of instruments and tools in maintaining, troubleshooting, and operating electrical motors.
_____ 3. List and describe functions of electric motors.

Motor Control Systems (ELT 1413)

_____ 1. Demonstrate the ability to install and troubleshoot different control circuits and devices.

Solid State Motor Control (ELT 2424)

_____ 1. Demonstrate the ability to apply general safety and safety requirements for working on and around electrical motors.
_____ 2. Demonstrate the principles of solid state motor controls.
_____ 3. Demonstrate the ability to discuss and operate AC and DC variable speed drives.

Programmable Logic Controllers (ELT 2613)

_____ 1. Describe the principles of PLC's.
_____ 2. Utilize the different types of PLC hardware.
_____ 3. Demonstrate mastery of numbering systems, encoding/decoding, logical operations, and Boolean expressions.
_____ 4 Demonstrate the ability to program all types of internal and discrete instructions.
_____ 5 Demonstrate the ability to troubleshoot and maintain different programmable controllers systems.

Advanced Programmable Logic Controllers (ELT 2623)

_____ 1. Demonstrate the ability to program all types of high order instructions.
_____ 2. Demonstrate the ability to troubleshoot and maintain advanced PLC controls.

Fundamentals of Electronics (EET 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environments.
_____ 2. Demonstrate and utilize proper breadboarding techniques.
_____ 3. Demonstrate proficiency in the use of a calculator.
_____ 4. Demonstrate the proper use and operation of test equipment.
_____ 5. Demonstrate proper soldering and desoldering techniques.

DC Circuits (EET 1114)

_____ 1. Demonstrate and apply an understanding of a basic electrical circuit.
_____ 2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.
_____ 3. Analyze and evaluate the parameters of a series circuit.
_____ 4. Analyze and evaluate the parameters of a parallel circuit.
_____ 5. Analyze and evaluate the parameters of a series-parallel circuit.
_____ 6. Apply network theorems to the analysis of complex circuits.
_____ 7. Explain capacitance and demonstrate its application in DC and transient circuits.
_____ 8. Explain inductance and demonstrate its application in DC and transient circuits.

AC Circuits (EET 1123)

_____ 1. Analyze a sine wave and explain its characteristics and application to AC circuits.
_____ 2. Analyze inductive and capacitive reactance in series and parallel circuits.
_____ 3. Analyze transformer voltage, current, impedance transformations, and applications.
_____ 4. Explain RLC non-resonant circuits.
_____ 5. Explain RLC resonant circuits.
_____ 6. Explain and classify filters.

Digital Electronics (EET 1214)

_____ 1. Perform mathematical operations in digital number systems.
_____ 2. Classify logic gates and explain their functions.
_____ 3. Construct and analyze combination logic circuits, including encoders/decoders.
_____ 4. Minimize logic circuits using Boolean algebra and Karnaugh mapping.
_____ 5. Compare and interface logic families and explain specifications of each.
_____ 6. Analyze the flip flop circuits and explain their operations.
_____ 7. Analyze sequential logic circuits and demonstrate the operations of shift registers, counters, and wave form generators.
_____ 8. Explain and demonstrate the principles and operation of multiplexer/demultiplexer circuits display.
_____ 9. Explain and demonstrate the principles and operations of the A/D and D/A digital circuits.
_____ 10. Analyze principles and operations of digital display devices.
_____ 11. Explain the operation of basic memory circuits.

Solid State Devices and Circuits (EET 1314)

_____ 1. Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
_____ 2. Explain semiconductor diode theory and apply to diode circuits.
_____ 3. Analyze the operation of semiconductor special purpose diodes.
_____ 4. Analyze the operation of bipolar junction transistors.
_____ 5. Explain and demonstrate the biasing of a transistor.
_____ 6. Explain and analyze the construction of BJT amplifiers.
_____ 7. Analyze the operation of field effect transistors and demonstrate their applications.
_____ 8. Analyze the operation of thyristors and demonstrate their applications.

Microprocessors (EET 1324)

_____ 1. Demonstrate an understanding of microprocessor structure and terminology.
_____ 2. Analyze the architectural design of microprocessors.
_____ 3. Describe the use of instruction sets and machine codes in operating microprocessors.

_____ 4. Understand principles and operation of types of microprocessor memory circuits.
_____ 5. Develop, execute, and debug microprocessor programs in assembly language.

Linear Integrated Circuits (EET 2334)

_____ 1. Analyze and demonstrate the effects of frequency on amplifiers.
_____ 2. Describe the principles, operation, and characteristics of operational amplifier.
_____ 3. Describe and demonstrate the function and operational characteristics of op-amps in linear applications.
_____ 4. Describe and demonstrate the function and operational characteristics of op-amp in non-linear applications.
_____ 5. Describe the function and operating characteristics of voltage regulators.

Interfacing Techniques (EET 2514)

_____ 1. Describe Industry Standards for Interfacing.
_____ 2. Identify signals related to parallel and serial ports.
_____ 3. Describe interfacing requirements of computer peripherals.
_____ 4. Describe special purpose large scale integration devices.
_____ 5. Explain and demonstrate methods for converting physical variables.
_____ 6. Use microprocessor to evaluate data as a result of physical variables taking place.

Fluid Power (INT 1214)

_____ 1. Define and describe basic laws governing fluids.
_____ 2. Identify and draw symbols for hydraulics and pneumatics.
_____ 3. Describe operation and nomenclature of various pumps and compressors.
_____ 4. Explain fluids as pertaining to the transmission of energy.
_____ 5. Describe the operation of flow, pressure, and directional control valves.
_____ 6. Explain the types of actuators used in pneumatics and hydraulics.
_____ 7. Explain, construct, and troubleshoot various hydraulic and pneumatic circuits.
_____ 8. Demonstrate the use of electro-mechanical controls in hydraulic and pneumatic circuits.

Fundamentals of Robotics (ROT 1113)

_____ 1. Describe the various major components of all robots.
_____ 2. Demonstrate safety procedures used in the automated environment.
_____ 3. Demonstrate the ability to operate robots.

Industrial Hydraulics (ROT 1213)

_____ 1. Define and describe basic laws governing liquids.
_____ 2. Identify and draw symbols for hydraulics.
_____ 3. Describe operation and nomenclature of various pumps.
_____ 4. Explain liquids as pertaining to the transmission of energy.
_____ 5. Describe the operation of flow, pressure, and directional control valves.
_____ 6. Explain the types of actuators used in hydraulics.
_____ 7. Explain, construct, and troubleshoot various hydraulic circuits.

Industrial Pneumatics (ROT 1223)

_____ 1. Define and describe basic laws governing gases
_____ 2. Identify and draw symbols for pneumatics.
_____ 3. Describe the operation and nomenclature of various compressors.
_____ 4. Explain fluids as pertaining to the transmission of energy.
_____ 5. Describe the operation of flow, pressure, and directional control valves.
_____ 6. Explain the types of actuators used in pneumatics.
_____ 7. Explain, construct, and troubleshoot various pneumatic circuits.
_____ 8. Demonstrate the use of electro-mechanical controls in hydraulic and pneumatic circuits.

Industrial Robotics (ROT 1313)

_____ 1. Demonstrate an ability to integrate a robot into a process.
_____ 2. Demonstrate an ability to integrate peripheral equipment.
_____ 3. Demonstrate an ability to troubleshoot and maintain a robotics workcell.

Automated Manufacturing Controls (ROT 2413)

_____ 1. Demonstrate the ability to develop a robotics process.
_____ 2. Demonstrate the ability to interface components of a robotics process

_____ 3. Demonstrate the ability to evaluate and troubleshoot a robotics process.

Servo Control Systems (ROT 2423)

_____ 1. Identify and discuss the components and characteristics of a servo system.
_____ 2. Demonstrate the ability to construct and analyze open loop and closed loop systems.
_____ 3. Demonstrate the ability to troubleshoot and repair a servo control system.

Mechanical Systems (ROT 2613)

_____ 1. Describe the major components used in mechanical drive systems.
_____ 2. Apply the principles of installation, maintenance, and troubleshooting in mechanical drive systems.

Special Project (ROT 291(1-3))

_____ 1. Develop a written plan which details the activities and projects to be completed.
_____ 2. Assess accomplishment of objectives.
_____ 3. Utilize a set of written guidelines for the special project.

Supervised Work Experience (ROT 292(1-6))

_____ 1. Apply technical skills needed to be a viable member of the work force.
_____ 2. Apply skills developed in other program area courses.
_____ 3. Apply human relationship skills.
_____ 4. Apply and practice positive work habits and responsibilities.
_____ 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
_____ 6. Assess accomplishment of objectives.
_____ 7. Utilize a set of written guidelines for the Supervised Work Experience.

STUDENT COMPETENCY PROFILE
FOR
TELECOMMUNICATIONS TECHNOLOGY

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Statistical Process Control (MFT 2313)

_____ 1. Describe and discuss the underling philosophy of SPC.
_____ 2. Apply SPC concepts.

Fundamentals of Electronics (EET 1102)

_____ 1. Explain, demonstrate, and practice general safety procedures in the shop, lab, and industrial environments.
_____ 2. Demonstrate and utilize proper breadboarding techniques.
_____ 3. Demonstrate proficiency in the use of a calculator.
_____ 4. Demonstrate the proper use and operation of test equipment.
_____ 5. Demonstrate proper soldering and desoldering techniques.

DC Circuits (EET 1114)

_____ 1. Demonstrate and apply an understanding of a basic electrical circuit.
_____ 2. Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, and power in DC.
_____ 3. Analyze and evaluate the parameters of a series circuit.
_____ 4. Analyze and evaluate the parameters of a parallel circuit.
_____ 5. Analyze and evaluate the parameters of a series-parallel circuit.
_____ 6. Apply network theorems to the analysis of complex circuits.
_____ 7. Explain capacitance and demonstrate its application in DC and transient circuits.
_____ 8. Explain inductance and demonstrate its application in DC and transient circuits.

AC Circuits (EET 1123)

_____ 1. Analyze a sine wave and explain its characteristics and application to AC circuits.
_____ 2. Analyze inductive and capacitive reactance in series and parallel circuits.
_____ 3. Analyze transformer voltage, current, impedance transformations, and applications.
_____ 4. Explain RLC non-resonant circuits.
_____ 5. Explain RLC resonant circuits.
_____ 6. Explain and classify filters.

Digital Electronics (EET 1214)

_____ 1. Perform mathematical operations in digital number systems.
_____ 2. Classify logic gates and explain their functions.
_____ 3. Construct and analyze combination logic circuits, including encoders/decoders.
_____ 4. Minimize logic circuits using Boolean algebra and Karnaugh mapping.
_____ 5. Compare and interface logic families and explain specifications of each.
_____ 6. Analyze the flip flop circuits and explain their operations.
_____ 7. Analyze sequential logic circuits and demonstrate the operations of shift registers, counters, and wave form generators.
_____ 8. Explain and demonstrate the principles and operation of multiplexer/demultiplexer circuits display.
_____ 9. Explain and demonstrate the principles and operations of the A/D and D/A digital circuits.
_____ 10. Analyze principles and operations of digital display devices.
_____ 11. Explain the operation of basic memory circuits.

Solid State Devices and Circuits (EET 1314)

_____ 1. Explain the characteristics of semiconductor materials and theory of operation of PN junctions.
_____ 2. Explain semiconductor diode theory and apply to diode circuits.
_____ 3. Analyze the operation of semiconductor special purpose diodes.
_____ 4. Analyze the operation of bipolar junction transistors.
_____ 5. Explain and demonstrate the biasing of a transistor.
_____ 6. Explain and analyze the construction of BJT amplifiers.

_____ 7. Analyze the operation of field effect transistors and demonstrate their applications.

_____ 8. Analyze the operation of thyristors and demonstrate their applications.

Microprocessors (EET 1324)

_____ 1. Demonstrate an understanding of microprocessor structure and terminology.

_____ 2. Analyze the architectural design of microprocessors.

_____ 3. Describe the use of instruction sets and machine codes in operating microprocessors.

_____ 4. Understand principles and operation of types of microprocessor memory circuits.

_____ 5. Develop, execute, and debug microprocessor programs in assembly language.

Computer Fundamentals for Electronics/Electricity (EET 1613)

_____ 1. Demonstrate the essentials of microcomputer components.

_____ 2. Demonstrate an understanding of essential microcomputer peripherals.

_____ 3. Demonstrate an understanding of essential microcomputer operating systems.

_____ 4. Demonstrate an understanding of essential microcomputer architecture.

_____ 5. Create a batch file.

_____ 6. Use editing, debugging techniques.

_____ 7. Set up and configure a microcomputer using operating system.

_____ 8. Demonstrate competency with a graphic operating system.

Drafting for Electronic/Electrical Technology (EET 1713)

_____ 1. Demonstrate an understanding of drafting fundamentals using block, flow and single line diagrams.

_____ 2. Demonstrate an understanding of electronic symbols, components, and references used in schematic and logic diagrams.

_____ 3. Demonstrate an understanding of printed circuitry and packaging drawings.

_____ 4 Demonstrate an understanding of electronics drafting using CAD.

Linear Integrated Circuits (EET 2334)

_____ 1. Analyze and demonstrate the effects of frequency on amplifiers.
_____ 2. Describe the principles, operation, and characteristics of operational amplifier.
_____ 3. Describe and demonstrate the function and operational characteristics of op-amps in linear applications.
_____ 4. Describe and demonstrate the function and operational characteristics of op-amp in non-linear applications.
_____ 5. Describe the function and operating characteristics of voltage regulators.

Electronic Communications (EET 2414)

_____ 1. Explain the operation of the components of a communication system.
_____ 2. Explain and perform signal and noise analysis.
_____ 3. Analyze and demonstrate the characteristics and operation of AM systems.
_____ 4. Analyze and demonstrate the characteristics and operation of FM systems.
_____ 5. Analyze and demonstrate the characteristics and operation of Digital Modulation.
_____ 6. Analyze and explain the characteristics of wave propagation, antennas, and transmission lines.
_____ 7. Analyze and explain one-way and two-way communication.

Fundamentals of Fiber Optics (EET 2423)

_____ 1. Describe history and advantages of fiber optic systems.
_____ 2. Explain the operational and application of optical signal sources.
_____ 3. Explain the operation and application of fiber optic system components.
_____ 4. Explain the theory of light propagation in vacuum and in optical fiber.
_____ 5. Describe properties of different types of optical fibers.

Fundamentals of Telecommunications (TCT 1114)

_____ 1. Discuss the history and development of voice/data communications.
_____ 2. Define, describe, and discuss all aspects of basic telephone service.

_____ 3. Define, describe, and discuss fundamental concepts of data communications/networks.
_____ 4. Define, describe, and discuss telecommunications traffic engineering, management, and system implementation.

Telephone Systems (TCT 2214)

_____ 1. Explain and test the operation and installation of key systems.
_____ 2. Explain and test the operation and installation of digital key systems.

PBX Systems (TCT 2224)

_____ 1. Discuss the general description of the PBX.
_____ 2. Explain the system configuration.
_____ 3. Explain the paperwork involved for installation.
_____ 4. Explain installation and test procedures and extension test procedures.
_____ 5. Explain and define PBX, maintenance, and troubleshooting procedures.
_____ 6. Explain multi-line extension telephones.

Digital Communications (TCT 2324)

_____ 1. Review the characteristics and operation of digital modulation.
_____ 2. Review various data communication methods.
_____ 3. Define, discuss, and troubleshoot PAM communication systems.
_____ 4. Define, discuss, and troubleshoot PTM communication systems.
_____ 5. Discuss analog to digital (A/D) and digital to analog (D/A) conversion processes.
_____ 6. Analyze and troubleshoot pulse code modulation (PCM) communication systems.
_____ 7. Explain the different types of transmission modes.
_____ 8. Analyze and troubleshoot shift keying systems.

Fundamentals of Digital Communications (TCT 2314)

_____ 1. Explain, define, and measure basic pulses and pulse characteristics as used in digital communications.
_____ 2. Explain, define measure different characteristics, and troubleshoot PAM pulse amplitude modulation) signals and systems in the time and frequency domains.

_____ 3. Explain, define, and measure different characteristics and troubleshoot Pulse Width/Pulse Position Modulation signals and systems.

Microwave and Satellite Systems (TCT 2414)

_____ 1. Identify and discuss different microwave applications.
_____ 2. Identify and describe functions of microwave component parts.
_____ 3. Identify and discuss satellite communication systems.
_____ 4. Identify and discuss cellular telephone systems.

Network Systems (TCT 2424)

_____ 1. Discuss, describe, apply network fundamentals and install network software.
_____ 2. Discuss and describe voice networks, troubleshoot network communications interface.
_____ 3. Discuss, describe, and identify wide area networks.
_____ 4. Discuss, operate, and troubleshoot LAN and access the internet.

Special Project (TCT 291(1-3))

_____ 1. Develop a written plan which details the activities and projects to be completed.
_____ 2. Assess accomplishment of objectives.
_____ 3. Utilize a set of written guidelines for the special project.

Supervised Work Experience (TCT 292(1-6)

_____ 1. Apply technical skills needed to be a viable member of the work force.
_____ 2. Apply skills developed in other program area courses.
_____ 3. Apply human relationship skills.
_____ 4. Apply and practice positive work habits and responsibilities.
_____ 5. Work with instructor and employer to develop written occupational objectives to be accomplished.
_____ 6. Assess accomplishment of objectives.
_____ 7. Utilize a set of written guidelines for the Supervised Work Experience.